

## A Comparative Retrospective Analysis of Conservative Versus Surgical Management of Distal Radius Fractures

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### Abstract:

**Background:** Distal radius fractures are common orthopedic injuries with significant functional and socioeconomic impact. The choice between conservative and surgical management remains controversial, particularly in resource-limited settings.

**Aim:** To compare clinical, functional, and complication outcomes between conservative and surgical management of distal radius fractures.

**Methodology:** A retrospective comparative cohort study was conducted at Department of Orthopaedics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India. A total of 88 adult patients were equally divided into conservative (casting/splinting) and surgical (mainly volar locking plate fixation) groups. Outcomes assessed included healing time, functional recovery, pain (VAS), complications, return to work, and patient satisfaction. Statistical analysis was performed using appropriate tests with  $p < 0.05$  considered significant.

**Results:** Surgical management showed significantly faster healing (6.2 vs 9.8 weeks) and earlier return to work (8.3 vs 11.8 weeks). Functional outcomes, including grip strength, range of motion, and pain scores, were significantly better in the surgical group. However, conservative treatment had more union-related complications, while surgical cases had procedure-related complications and higher reoperation rates.

**Conclusion:** Surgical management provides superior functional outcomes and faster recovery, despite higher procedural risks, and may be preferred in appropriately selected patients.

**Keywords:** Distal radius fracture, Conservative management, Surgical management, Functional outcome, Retrospective study, Orthopedics.

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### Introduction

Distal radius fractures are one of the most frequent orthopedic injuries that are experienced in clinical practice, and they constitute a considerable percentage of upper limb fractures all over the world. The distribution of these injuries has a bimodal distribution with young people being the most affected by high energy injuries like road traffic accidents or sport injuries and the elderly population because of low energy, especially by falling off standing height [1]. The cases and burden of distal radius fractures are significant in areas like Bihar, India where occupational hazards, road safety issues and the growing elderly population co-exist. The socioeconomic effect of such injuries is immense as it may result in

temporary or permanent disability, productivity, and high healthcare use.

The best management of distal radius fractures has been an issue of continued discussion with treatment options generally divided into the conservative and surgical options [2]. Conservative management usually entails closed reduction and immobilization with the help of casts or splinters. This is the traditional approach to care, especially when there are stable and minimally displaced fractures. In resource-contained environments, as well as with patients where surgery might be too risky because of comorbidity or age, it is frequently used. Conservative treatment, however, must be closely monitored

to maintain fracture alignment, since secondary displacement can undermine functional results [3].

Surgical management, on the other hand, involves a set of procedures, such as percutaneous pinning, external fixation, and open reduction with internal fixation that consists of plates and screws. Surgical surgery is usually recommended in unstable, displaced, or intra-articular fracture, particularly in younger and more active patients whereby restoration of anatomical alignment is important in ensuring functional recovery [4]. Surgical methodology varies according to several factors such as the fracture pattern, bone quality, expertise of the surgeon, and the available resources. Over the past few years, volar locking plate systems have transformed the treatment of distal radius fractures, as they offer solid fixation even in bone with osteoporosis, enabling patients to be mobilized sooner and perhaps with better functional results [5,6].

Although surgical techniques have been improved, the choice of conservative or surgical treatment is not necessarily clear cut. Both strategies have their benefits and drawbacks. Conservative treatment eliminates the risks of surgical treatment, e.g. infection, complications of anesthesia, implant-related complications. Nevertheless, it could be correlated with extended immobilization, stiffness of joints, and increased chances of malunion in some types of fractures. On the other hand, surgical management though seeking to give a precise anatomical reduction and early restoration of function is not devoid of complications. These can encompass infection, tendon irritation or rupture, nerve damage, hardware issues and in certain instances secondary procedures may be required to remove implants [7,8].

This inconsistency in the results found in the literature also makes it difficult to come up with a treatment protocol that is universally acceptable. The functional recovery, levels of pain, time to union, and patient satisfaction may vary substantially with regard to the selected management strategy, and patient-specific aspects, including age, activity level, bone density, and comorbid conditions. In the Bihar case example, India, other variables like availability of special orthopedic care, financial limitations, patient awareness are also significant in their treatment choices and results. These regional considerations emphasize the need to have context-specific research that can be used to influence clinical decision making.

The present research paper seeks to make a full comparison between conservative and surgical interventions in management of distal radius fractures in the study region of Bihar India. Through assessment of the essential outcome measures like time to fracture healing, recovery of functional use of the wrist, level of pain, occurrence of complications, recovery to daily activities or work, patient satisfaction, and

reoperation rates, the study aims at producing evidence to inform clinical practice. Knowledge of the comparative advantages and disadvantages of each of these options in a clinical environment will help clinicians to develop the best treatment plans based on the needs of each patient, the nature of the fractures and resources available.

Moreover, the results of the study will be useful in advancing the current debate on how distal radius fractures should be managed due to the use of region-specific information. This type of evidence is necessary to create guidelines that are not only effective clinically, but also practical and available in various health care settings. Finally, it is aimed at better patient outcomes, decreased disability burden, and quality care of people with distal radius fractures.

### Methodology

**Study Design and Study Duration:** This study was conducted as a retrospective comparative cohort study over a period of one year from March 2025 to February 2026. The primary objective was to compare the clinical and functional outcomes of conservative and surgical management in patients presenting with distal radius fractures. Being retrospective in nature, the study relied on previously recorded patient data available in hospital records.

**Study Area:** The study was carried out in the Department of Orthopaedics at Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India

**Study Population:** The study population comprised patients diagnosed with distal radius fractures who presented to the orthopaedics department during the study period. These patients were managed either conservatively or surgically depending on the nature of the fracture, patient factors, and treating surgeon's decision.

**Sample Size:** A total of 88 patients were included in the study. These patients were divided equally into two groups based on the treatment modality received, with 44 patients undergoing conservative management and 44 patients undergoing surgical intervention. This sample size was determined based on the availability of complete and eligible patient records during the study period.

**Sampling Technique:** A retrospective sampling technique was employed in this study. Patient records were systematically reviewed, and those fulfilling the inclusion criteria were selected. Only cases with complete clinical, radiological, and follow-up data were included to ensure the reliability of the analysis.

### Inclusion Criteria

- Patients aged 18 years and above

- Radiologically confirmed distal radius fractures
- Patients who received either conservative (casting/splinting) or surgical treatment (e.g., volar locking plate fixation)
- Complete medical records with follow-up details available

#### Exclusion Criteria

- Patients with polytrauma or multiple fractures
- History of previous wrist surgery
- Patients with pathological fractures or systemic diseases affecting bone healing (e.g., severe osteoporosis, malignancy)
- Incomplete medical records or loss to follow-up

**Data Collection:** Data were collected retrospectively from hospital medical records and case files. The collected data included demographic details such as age and gender, injury-related information including mechanism and type of fracture, treatment modality, and follow-up outcomes. Care was taken to ensure that all relevant variables required for comparison were accurately recorded.

**Outcome Measures:** The outcome measures assessed in this study included both clinical and functional parameters. Time to fracture healing was determined radiologically. Functional outcomes were evaluated based on range of motion, including wrist flexion, extension, pronation, and supination, as well as grip strength. Pain levels were assessed using the Visual Analogue Scale (VAS) at 3 and 6 months follow-up. Additional parameters included complications such as malunion, infection, stiffness, or implant-related issues, time taken to return to daily activities or work, patient satisfaction scores on a scale of 1 to 10, and any requirement for reoperation.

**Procedure:** Patient records were identified from the hospital database and categorized into two groups

based on the treatment modality received. Patients in the conservative group were managed with closed reduction followed by immobilization using a plaster cast or splint. Patients in the surgical group underwent operative intervention, most commonly open reduction and internal fixation using volar locking plates. Follow-up data were reviewed at regular intervals, particularly at 3 months and 6 months, to assess healing and functional recovery.

**Statistical Analysis:** The collected data were compiled and analyzed using appropriate statistical software such as SPSS. Descriptive statistics, including mean, standard deviation, frequencies, and percentages, were used to summarize the data. Comparative analysis between the two groups was performed using the chi-square test for categorical variables and the independent t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant.

#### Result

Table 1 compares baseline characteristics and healing outcomes between conservative and surgical groups (n=44 each). The mean age was significantly higher in the conservative group ( $54 \pm 10$  years) compared to the surgical group ( $46 \pm 9$  years) ( $p < 0.01$ ), while gender distribution was similar between groups (22/22 vs 26/18,  $p = 0.38$ ). Healing outcomes were significantly better in the surgical group, with a shorter time to healing ( $6.2 \pm 1.2$  weeks vs  $9.8 \pm 1.5$  weeks) and earlier return to work ( $8.3 \pm 1.6$  weeks vs  $11.8 \pm 2.1$  weeks), both with p-values  $< 0.001$ . Overall, surgical management was associated with faster recovery and improved functional outcomes despite a younger patient population.

**Table 1: Baseline Characteristics and Healing Outcomes**

Parameter	Conservative (n=44)	Surgical (n=44)	p-value
Mean Age (years)	$54 \pm 10$	$46 \pm 9$	$< 0.01$
Gender (M/F)	22 / 22	26 / 18	0.38
Time to Healing (weeks)	$9.8 \pm 1.5$	$6.2 \pm 1.2$	$< 0.001$
Return to Work (weeks)	$11.8 \pm 2.1$	$8.3 \pm 1.6$	$< 0.001$

Table 2 compares functional and pain outcomes between conservative and surgical groups. The surgical group demonstrated significantly better functional outcomes, with higher grip strength ( $95 \pm 4\%$  vs  $84 \pm 6\%$ ), range of motion ( $97 \pm 3\%$  vs  $79 \pm 7\%$ ), and wrist flexion/extension ( $91 \pm 5\%$  vs  $74 \pm 8\%$ ), all with p-values  $< 0.001$ . Pain scores assessed by VAS were lower in the surgical group at both 3

months ( $3.1 \pm 0.9$  vs  $4.2 \pm 1.0$ ) and 6 months ( $1.2 \pm 0.6$  vs  $2.1 \pm 0.8$ ), indicating better pain relief ( $p < 0.01$ ). Additionally, patient satisfaction was higher in the surgical group ( $8.6 \pm 1.0$  vs  $7.1 \pm 1.2$ ,  $p < 0.001$ ). Overall, surgical management resulted in significantly superior functional recovery, reduced pain, and greater patient satisfaction compared to conservative treatment.

Outcome	Conservative (Mean ± SD)	Surgical (Mean ± SD)	p-value
Grip Strength (%)	84 ± 6	95 ± 4	<0.001
Range of Motion (%)	79 ± 7	97 ± 3	<0.001
Wrist Flexion/Extension (%)	74 ± 8	91 ± 5	<0.001
VAS Score (3 months)	4.2 ± 1.0	3.1 ± 0.9	<0.01
VAS Score (6 months)	2.1 ± 0.8	1.2 ± 0.6	<0.01
Patient Satisfaction (1–10)	7.1 ± 1.2	8.6 ± 1.0	<0.001

Table 3 shows the comparison of complications and reoperation rates between conservative and surgical management groups (n=44 each). In the conservative group, complications included malunion in 5 cases (11.4%), delayed union in 4 (9.1%), nonunion in 1 (2.3%), and reflex sympathetic dystrophy in 1 (2.3%), with a reoperation rate of 1 (2.3%). In contrast, the surgical group experienced complications

such as hardware-related issues in 3 cases (6.8%), infection in 2 (4.5%), post-operative hematoma in 2 (4.5%), and nerve injury in 1 (2.3%), with a higher reoperation rate of 3 (6.8%). Overall, conservative management was associated with union-related complications, whereas surgical management showed procedure-related complications and a relatively higher need for reoperation.

Parameter	Conservative (n=44)	Surgical (n=44)
<b>Complications</b>		
Malunion	5 (11.4%)	–
Delayed Union	4 (9.1%)	–
Nonunion	1 (2.3%)	–
Reflex Sympathetic Dystrophy	1 (2.3%)	–
Infection	–	2 (4.5%)
Nerve Injury	–	1 (2.3%)
Hardware Complication	–	3 (6.8%)
Post-operative Hematoma	–	2 (4.5%)
<b>Reoperation Rate</b>	1 (2.3%)	3 (6.8%)

## Discussion

The results of the current study prove the obvious benefit of surgical treatment over conservative one in terms of quicker recovery and sooner ability to resume functional activity, which is acceptable by earlier published works. To give an example, the average time to heal in our surgical ( $6.2 \pm 1.2$  weeks) and the conservative group ( $9.8 \pm 1.5$  weeks) is very similar to the meta-analysis by Song et al., (2015) [1], which indicated that union times were significantly shorter with operative fixation because of enhanced fracture stability and alignment. On the same note, the earlier recovery to work in our study ( $8.3 \pm 1.6$  weeks vs  $11.8 \pm 2.1$  weeks) is similar to Ochen et al., (2020) [4] who were able to conclude that operative therapy enables earlier functional recovery, especially in high-demand patients. Nonetheless, certain opposing facts are also present, particularly in older groups, where Testa et al., (2019) [2] did not find any significant difference in the long-term healing time between surgical and conservative methods, indicating that age and bone quality could be factors that determine the effectiveness of these methods."

Regarding functional outcomes, our findings of better grip strength ( $95 \pm 4\%$  vs  $84 \pm 6\%$ ), range of motion ( $97 \pm 3\%$  vs  $79 \pm 7\%$ ) and the wrist mobility in the surgical group are well supported by the previous

studies. In (2010), [9], Marcheix et al., revealed that anatomical reduction, which has been attained by surgical fixation, is very important in improving the biomechanics and functional recovery of the wrist. Similarly, Chung et al., (2008) [10] indicated an improvement in functional scores through volar locking plates as compared to conservative casting, especially among active individuals. These results support the significance of accurate fracture alignment to obtain optimal results. On the other hand, other randomized trials like the one carried out by Walenkamp et al., (2014) [5] have shown that there are minimal differences in the long-term functional outcome of the two treatments, which points to the possibility that conservative treatment might remain sufficient in selected stable fracture patterns.

Another area where our results support surgical intervention is pain reduction, where both 3 and 6-month VAS scores were lower. This fact is in line with the ORCHID study by Bartl et al., (2014) [11] that indicated a marked reduction in pain in surgical patients because of stable fixation and earlier mobilization. Alharbi et al., (2020) [8] also gave a similar conclusion since they found that early pain control is more effective with operative management, but the differences are likely to decrease over time. Conversely, other studies indicate that early pain treatment is superior in surgery but long-term pain

outcome might not be much different and therefore the short-term advantages of a procedure must be weighed against the risks of a procedure.

Complication profile that was witnessed in our study also reflects the trends in literature with conservative management having higher malunion (11.4) and delayed union (9.1), and the surgical management having procedure-related complications like infection (4.5) and hardware problems (6.8). The results are similar when compared to those of Lutz et al., (2014) [12] who found a higher incidence of malunion in nonoperative and more surgical complications in operative groups. Correspondingly, Vargaonkar (2014) [13] emphasized that inappropriate immobilization during the conservative treatment may result in poor fracture alignment and consequent functional impairment. Conversely, the presence of surgical complications like nerve damage and hematoma as observed in our study is well-reported hazards of invasive procedures, and thus, it is important to reiterate the significance of surgical skills and patient selection.

Our study also indicates that surgical management is preferable due to better patient satisfaction outcomes ( $8.6 \pm 1.0$  vs  $7.1 \pm 1.2$ ), which could be explained by faster recovery time and restoration of functioning and less pain. This is in line with other studies conducted by Levin et al., (2017) [14] who also highlighted that patients tend to measure the success of treatment based on early return to independence and daily living. It is worth mentioning though that satisfaction is a multifactorial concept and affected by patient expectations, socioeconomic factors, and comorbidities. Conversely, other studies, such as those by Ermutlu et al., (2020) [6] have indicated similar satisfaction levels between treatment groups in the long run, which indicates that the conservative management can still be used with low-demand patients.

In general, the current research results are mostly consistent with the current evidence supporting surgery as a solution to the achievement of a quicker recovery, superior functional results, and enhanced patient satisfaction in distal radius fractures. However, some conflicting evidence of some randomized trials and studies in elderly groups shows that conservative treatment remains relevant, especially in patients with less functional needs or increased surgical risks. That is why the treatment choice must be tailored and based on the patient age, fracture type, functional needs, and risks of each modality.

### Conclusion

The current retrospective comparative study illustrates that surgical treatment of distal radius fractures produce better clinical and functional results than the conservative treatment. Patients who received surgical intervention had quicker fracture healing and were able to resume normal functioning

earlier and had much better recovery of grip strength, wrist mobility as well as overall range of motion. The level of pain was lower in the surgical group at follow-up and patient satisfaction was significantly greater. Despite the complications related to the conservative management, including malunion and slow healing, surgical treatment demonstrated the risks related to the procedure including infection and hardware problems and a marginally greater necessity to reoperate. In general, even though there are surgical risks, operative management offers more optimal functional recovery and patient-reported outcomes, indicating that it might be the most desirable in the case of patients properly selected.

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