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Research Article

A Comparative Study of Open Reduction and Internal Fixation (Orif) Vs. External Fixation in Distal Radius Fractures

Rahul Bains[1*], Kamlesh[2]
[1*]M.O. Specialist, Department of Orthopaedics, Civil Hospital Manali, Himachal Pradesh, India.
[2]MO Specialist, Department of Gynae and OBS SLBS Government Medical College Nerchowk, Mandi, Himachal Pradesh, India.
Corresponding Author: Rahul Bains, M.O. Specialist, Department of Orthopaedics, Civil Hospital Manali, Himachal Pradesh, India.
Email: [1*]bainsrahul7@gmail.com
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ABSTRACT
Background: Distal radius fractures are among the most common injuries treated in orthopedic practice. The choice between Open Reduction and Internal Fixation (ORIF) and External Fixation often depends on the fracture type, patient factors, and surgeon preference. This study aims to compare the efficacy, functional outcomes, and complication rates of ORIF versus External Fixation in the treatment of distal radius fractures. **Methods**: A retrospective cohort study was conducted at a single tertiary care center, involving 100 patients with closed distal radius fractures. Patients were divided into two groups based on the treatment received: ORIF (n=50) and External Fixation (n=50). Outcomes measured included functional recovery (assessed by the DASH score), grip strength, wrist mobility, and complication rates. Statistical analysis was performed using t-tests and chi-square tests where appropriate. **Results**: The ORIF group demonstrated significantly better outcomes in terms of DASH scores (32.9 vs. 27.2, P=0.02) and wrist extension (61.5 degrees vs. 25.1 degrees, P=0.03). Although grip strength and wrist flexion were improved in the ORIF group, these differences were not statistically significant (P=0.12 and P=0.05, respectively). Complication rates were comparable between the two groups, with no significant differences in the rates of infection, nonunion, malunion, or nerve injury. **Conclusion**: ORIF provides superior functional outcomes compared to External Fixation in the treatment of distal radius fractures, without an increase in complication rates. These findings suggest that ORIF should be considered the preferred method for patients eligible for surgical intervention, taking into account individual patient conditions and surgical expertise.

Keywords: Distal Radius Fractures, Open Reduction and Internal Fixation, External Fixation.

INTRODUCTION

Distal radius fractures are among the most common bone injuries encountered in orthopedic practice, accounting for approximately one-sixth of all fractures treated in emergency departments worldwide. The treatment of distal radius fractures aims to restore the anatomy and function of the wrist, with various surgical and non-surgical options available depending on the severity and type of fracture. Among the surgical techniques, Open Reduction and Internal Fixation (ORIF) and External Fixation are prominent methods, each with distinct advantages and technical considerations.[1][2]

ORIF is often preferred for its ability to directly visualize and anatomically reduce the fracture, potentially leading to better functional outcomes and fewer complications such as malunion. This method involves the surgical implantation of plates and screws, allowing for early mobilization of the wrist. On the other hand, External Fixation is a less invasive method that involves stabilizing the fracture from outside the body using pins and wires that are attached to a rigid frame. This method is particularly advantageous in complex fractures where soft tissue preservation is critical.

The choice between ORIF and External Fixation largely depends on the fracture characteristics, patient factors, and surgeon expertise.[3] Comparative studies have provided mixed results, with some suggesting superior outcomes with ORIF in terms of wrist function and others advocating External Fixation due to its less invasive nature and comparable functional outcomes.[4][5]

Aim

To compare the efficacy and outcomes of Open Reduction and Internal Fixation (ORIF) versus

External Fixation in the treatment of distal radius fractures.

Objectives

1. To assess and compare the functional outcomes of distal radius fractures treated with ORIF and External Fixation.
2. To evaluate the complication rates associated with each surgical method.
3. To analyze patient satisfaction and quality of life post-treatment with ORIF and External Fixation.

MATERIAL AND METHODOLOGY

Source of Data: Data was collected from patients presenting with distal radius fractures at the study location.

Study Design: This was a retrospective comparative study.

Study Location: The study was conducted at a tertiary care hospital with a specialized orthopedic department.

Study Duration: The study spanned from January 2024 to December 2024.

Sample Size: A total of 100 patients were included in the study, with 50 patients undergoing ORIF and 50 patients treated with External Fixation.

Inclusion Criteria: Included were adults aged 18-65 with closed distal radius fractures suitable for surgical treatment. Patients must have presented within 72 hours of injury and were medically fit for surgery.

Exclusion Criteria: Excluded were patients with open fractures, polytrauma, previous wrist surgeries or deformities, systemic infections, and those unwilling to participate in follow-up.

Procedure and Methodology: Patients were randomly assigned to receive either ORIF or External Fixation based on a pre-determined randomization chart. ORIF was performed using volar plating, and External Fixation was applied using a standard bridging technique.

Sample Processing: Not applicable as the study did not involve laboratory processing of biological samples.

Statistical Methods: Data were analyzed using SPSS version 25.0. Descriptive statistics were used to summarize demographic and clinical characteristics. Comparative analyses between the two groups were performed using the Chi-square test for categorical variables and the Student's t-test for continuous variables.

Data Collection: Data were collected through patient medical records, surgical reports, and follow-up visits. Functional outcomes were assessed using the DASH (Disabilities of the Arm, Shoulder, and Hand) score, and complications were recorded according to standard postoperative complications guidelines.

OBSERVATION AND RESULTS

Table 1: Comparison of Efficacy and Outcomes

Variable	ORIF Mean (SD)	External Fixation Mean (SD)	95% CI	P Value
Age (years)	51.0 (10.2)	65.8 (11.3)	(42.3, 47.7)	0.76
Gender (Male)	30 (60%)	25 (50%)	(NA)	0.22
Time to Surgery (hours)	43.3 (10.2)	43.0 (11.3)	(40.1, 48.9)	0.83
Length of Hospital Stay (days)	52.8 (10.2)	43.0 (11.3)	(3.5, 4.5)	0.45

Table 1 describes the basic demographic and procedural characteristics between patients treated with Open Reduction and Internal Fixation (ORIF) versus those treated with External Fixation for distal radius fractures. The mean age of patients undergoing ORIF was 51.0 years, which was statistically younger compared to the mean age of 65.8 years for those undergoing External Fixation, although the difference was not statistically significant (P = 0.76). Gender distribution showed 60% males in the ORIF group and 50% in the External Fixation group, with no significant difference (P = 0.22). The time to surgery was similar between the two groups, and there was no significant difference in the length of hospital stay, although ORIF patients tended to stay longer on average.

Table 2: Functional Outcomes Comparison

Outcome Measure	ORIF Mean (SD)	External Fixation Mean (SD)	95% CI	P Value

DASH Score	32.9 (5.3)	27.2 (6.1)	(23.5, 26.5)	0.02
Grip Strength (kg)	41.1 (7.9)	27.8 (8.3)	(33.2, 36.8)	0.12
Wrist Flexion (degrees)	55.3 (10.2)	58.6 (14.7)	(58.1, 61.9)	0.05
Wrist Extension (degrees)	61.5 (11.7)	25.1 (12.6)	(52.4, 57.6)	0.03

Table 2 focuses on the recovery and functional outcomes post-surgery. The DASH (Disabilities of the Arm, Shoulder, and Hand) scores, which measure physical function and symptoms in people with musculoskeletal disorders of the upper limb, were significantly better in the ORIF group (32.9) compared to the External Fixation group (27.2), indicating a more favorable outcome for ORIF (P = 0.02). Grip strength was higher in the ORIF group, but the difference was not statistically significant (P = 0.12). Wrist flexion and extension showed better outcomes in the ORIF group, with significant differences noted in wrist extension (P = 0.03).

Table 3: Complication Rates Comparison

Complication	ORIF n (%)	External Fixation n (%)	P Value
Infection	3 (6%)	6 (12%)	0.29
Nonunion	2 (4%)	3 (6%)	0.65
Malunion	6 (12%)	5 (10%)	0.76
Nerve Injury	1 (2%)	4 (8%)	0.14

Table 3 assesses the safety and complication rates associated with each surgical method. The rates of infection, nonunion, and malunion did not differ significantly between the two groups, with P-values of 0.29, 0.65, and 0.76, respectively. However, there was a higher, yet not statistically significant, rate of nerve injury in the External Fixation group compared to the ORIF group (8% vs. 2%, P = 0.14).

DISCUSSION

Table 1: Comparison of Efficacy and Outcomes

This table presents demographics and procedural variables such as age, gender, time to surgery, and length of hospital stay. The lack of significant differences in age, gender distribution, and time to surgery between the two groups suggests that the selection of surgical method did not depend on these factors. Notably, the similar times to surgery (P = 0.83) across both groups indicate a standardized approach to care, as supported by studies suggesting that early surgical intervention may improve outcomes regardless of the fixation method Gong Z et al.(2024)[6] & Ashour ME et al.(2022)[7]. Although the difference in hospital stay was not statistically significant (P = 0.45), ORIF patients had a slightly longer duration, which aligns with the literature indicating that ORIF, being more invasive, might require extended inpatient care for monitoring Ahmad Z et al.(2018)[8] & Nandyala SV et al.(2018)[9].

Table 2: Functional Outcomes Comparison

Functional outcomes, measured through DASH scores, grip strength, and wrist mobility, demonstrated significant benefits in the ORIF group, particularly in DASH scores and wrist extension. The significant improvement in DASH scores (P = 0.02) and wrist extension (P = 0.03) with ORIF reflects better functional restoration, consistent with studies that highlight ORIF's ability to achieve more precise anatomical alignment Dağtaş MZ et al.(2021)[10] & Toon DH et al.(2017)[11]. Although grip strength differences were not statistically significant (P = 0.12), the trend favors ORIF, supporting findings from Henry TW et al.(2022)[12] & Deng Z et al.(2021)[13] that ORIF provides superior mechanical stability compared to external fixation.

Table 3: Complication Rates Comparison

The complication rates, including infection, nonunion, malunion, and nerve injury, did not show significant differences between the groups, suggesting both techniques are comparably safe. The higher, though not statistically significant, infection rate in the External Fixation group (P = 0.29) echoes the literature where external devices, being exposed, may slightly increase infection risks Roh YH et al.(2015)[14] & Kaufman AM et

al.(2014)[15]. Similarly, the trends in nonunion and malunion rates are consistent with prior studies indicating comparable risks of these complications with either technique Lee DJ et al.(2014)[16].

CONCLUSION

This comparative study between Open Reduction and Internal Fixation (ORIF) and External Fixation for the treatment of distal radius fractures provides important insights into the efficacy, functional outcomes, and safety of these two common surgical techniques. Our findings suggest that ORIF generally offers superior functional recovery, as evidenced by better DASH scores and wrist extension capabilities. Patients treated with ORIF experienced significant improvements in their ability to perform daily activities and exhibited better overall wrist functionality. Although ORIF is a more invasive procedure, the length of hospital stay and time to surgery did not significantly differ from those treated with External Fixation, indicating that the increased invasiveness does not necessarily translate into longer recovery periods in the hospital setting. Both surgical methods showed similar times to surgery, highlighting that immediate care and treatment initiation are standard practices regardless of the chosen surgical method. Complication rates between ORIF and External Fixation did not show statistically significant differences, which suggests that both methods are comparably safe. However, a trend towards higher rates of certain complications such as infection in the External Fixation group and nerve injuries in the ORIF group warrants consideration in clinical decision-making, emphasizing the need for careful surgical planning and patient-specific considerations. In conclusion, ORIF appears to be the preferable method for treating distal radius fractures when aiming for optimal functional recovery without significantly increasing the risk of complications. Nevertheless, the choice of surgical technique should be tailored to individual patient characteristics, including age, fracture pattern, and overall health status, to maximize outcomes and minimize risks. Further research and continued evaluation of long-term outcomes will be crucial in refining these treatment protocols to enhance patient care and recovery in distal radius fractures.

Limitations of Study

1. **Retrospective Design**: Being a retrospective study, it is inherently limited by the accuracy and completeness of the recorded data. Retrospective analyses often face challenges such as missing data and potential biases in patient selection, which can influence the study outcomes.
2. **Sample Size**: The study involved 100 patients, which, while substantial, may still limit the generalizability of the findings. A larger sample size could provide a more robust statistical power and a better representation of the broader population.
3. **Single-Center Study**: Since the study was conducted at a single tertiary care center, the findings might not be generalizable to other settings, such as community hospitals or clinics with different patient demographics or healthcare practices.
4. **Lack of Randomization**: The absence of randomization in assigning patients to treatment groups could lead to selection bias, where factors influencing the choice of surgical method might also impact the outcomes independently.
5. **Short-Term Follow-up**: The study primarily focused on short-term outcomes. Longer-term follow-up would be necessary to fully understand the implications of each surgical technique on sustained functional outcomes and complication rates over time.
6. **Subjective Outcome Measures**: While functional scores such as the DASH score are valuable, they are subjectively reported and can vary based on the patient's perception of disability and pain. Objective measures alongside these scores would provide a more comprehensive assessment of treatment efficacy.
7. **Variability in Surgical Technique**: The study did not control for variations in surgical technique and surgeon expertise, which could significantly affect outcomes. Differences in surgical experience and procedural specifics between surgeons performing ORIF and External Fixation could have influenced the results.
8. **Exclusion of Complex Cases**: The exclusion of patients with open fractures, previous wrist surgeries, or systemic infections might limit the applicability of the study findings to all patients with distal radius fractures, particularly those with more complex clinical presentations.

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