ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Comparative study on outcomes between open reduction and internal fixation with plating and K-wires plus casting for distal end radius fractures

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Submission: 29-05-2024 Revision: 29-07-2024 Publication: 01-09-2024

ABSTRACT

Background: Distal end radius fractures are common injuries treated in orthopedic practice, with varying treatment modalities influencing outcomes. **Aims and Objectives:** The study was designed to compare the outcomes between open reduction and internal fixation (ORIF) with plating and K-wires plus casting in patients treated for distal end radius fractures. **Materials and Methods:** One hundred patients with distal end radius fractures were included and divided into two groups: Group A (ORIF with plating) and Group B (K-wires plus casting), with 50 patients in each group. Parameters included were healing time, complication rates, functional recovery, patient satisfaction scores, pain levels during recovery, and the time to return to daily activities. **Results:** Group A demonstrated a shorter average healing time (8 weeks) compared to Group B (9 weeks). Complication rates showed 5% malunion and 4% delayed union in Group A, against 12% and 6%, respectively, in Group B. Functional recovery was higher in Group A, with 93% grip strength and 88% range of motion recovery. Patient satisfaction was also higher in Group A (8.5 out of 10) compared to Group B (7.5 out of 10). Pain levels during recovery were lower in Group A, and the time to return to daily activities was shorter (8 weeks for Group A versus 10 weeks for Group B). **Conclusion:** The study suggests that ORIF with plating offers better outcomes in terms of healing time, complication rates, functional recovery, patient satisfaction, pain management, and quicker return to daily activities than K-wires plus casting for distal end radius fractures.

Key words: Distal end radius fractures; Open reduction and internal fixation with plating; K-wires plus casting; Functional recovery; Patient satisfaction; Healing time

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v15i9.66271

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Distal radius fractures are among the most prevalent skeletal injuries presenting in emergency departments across the globe, constituting a significant percentage of adult bone fractures.[1] These injuries are not only detrimental to the immediate physical health of patients but also pose substantial challenges to their long-term functional recovery and quality of life.[2] The quest for the optimal treatment strategy for distal radius fractures has led to considerable debate among orthopedic professionals, with treatment options ranging from nonoperative approaches, such as casting, to various surgical interventions, including open reduction and internal fixation (ORIF) with diverse hardware configurations.[3,4]

While traditional casting has long been a fundamental treatment method for distal radius fractures, providing a non-surgical option that facilitates natural bone healing,[5] it may fall short in delivering optimal outcomes in terms of bone alignment, stability, and functional recovery, especially in cases involving complex fractures.[6] Conversely, ORIF, employing plating or K-wires combined with casting, aims to achieve precise anatomical alignment and stabilization of the fracture

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through surgical means, potentially offering enhanced outcomes regarding healing time, functional recovery, and patient satisfaction.[7] However, this surgical option comes with its own set of challenges, including increased costs and a heightened risk of surgical complications.

Aims and objectives

Aim

This study seeks to perform a comparative analysis of the outcomes of two distinct surgical treatment modalities for distal radius fractures: ORIF with plating, and K-wires plus casting.

Objectives

The objectives of the study are as follows:

To compare the healing times of patients treated with ORIF using plating versus those treated with K-wires plus casting.

To evaluate the incidence of complications such as malunion, delayed union, surgical site infections, and hardware irritation across the two surgical groups.

To analyze the extent of functional recovery, including grip strength and range of motion, among patients undergoing ORIF with plating compared to those receiving K-wires plus casting.

To assess patient satisfaction scores between the two surgical treatment groups.

To examine the pain levels experienced during recovery by patients treated with either ORIF with plating or K-wires plus casting.

To determine the time required for patients to resume daily activities following treatment with ORIF using plating versus K-wires plus casting.

MATERIALS AND METHODS

Study design and setting

This retrospective cohort study was designed to compare the outcomes of two surgical treatment modalities for distal end radius fractures: ORIF with plating versus K-wires plus casting. It was conducted at the Government General Hospital in Mahbubabad, Telangana, India, specifically within the orthopedic department. The study analyzed patient records from November 2023 to April 2024, covering a period of 6 months.

Participants

A total of 100 patients diagnosed with distal end radius fractures and treated at the Government General Hospital during the study period were included. They were divided into two groups based on the surgical treatment received: Group A underwent ORIF with plating, while Group B was treated with K-wires plus casting. Comprehensive reviews of patient records were conducted to gather demographic data, clinical characteristics, treatment specifics, and outcomes.

Inclusion criteria

Diagnosis of distal end radius fractures.

Treatment was received between November 2023 and April 2024 at the Government General Hospital, Mahbubabad.

Underwent either ORIF with plating or K-wires plus casting as the primary treatment.

Availability of complete medical records detailing treatment and outcomes.

Exclusion criteria

Incomplete medical records.

Lost to follow-up before treatment completion or outcome assessment.

Concurrent injuries or conditions impacting treatment outcomes.

Underwent alternative treatments were not considered in this study.

Previous surgical interventions for the same fracture.

Pathological fractures or nontraumatic cause-related fractures.

Data collection

Data on demographics, clinical characteristics, treatment specifics, and outcomes were extracted from medical records and electronic databases, adhering to the inclusion and exclusion criteria.

Outcome measures

Outcomes assessed included healing time, complication rates, functional recovery (assessing grip strength and range of motion), patient satisfaction, pain levels during recovery, time until return to daily activities, and overall treatment costs.

Statistical analysis

Patient characteristics and outcomes were summarized using descriptive statistics. Continuous variables were reported as means±standard deviations or medians with interquartile ranges and categorical variables as frequencies

and percentages. Comparisons between Group A and Group B were conducted using t-tests for continuous variables and Chi-square tests for categorical variables, with a $P<0.05$ indicating statistical significance.

Ethical considerations

The study received ethical approval from the Institutional Ethics Committee of the Government Medical College, Mahbubabad, ensuring adherence to ethical standards and patient confidentiality.

RESULTS

The retrospective cohort study aimed to compare the outcomes between two surgical treatment modalities—ORIF with plating and K-wires plus casting—for patients with distal end radius fractures treated at the Government General Hospital in Mahbubabad, Telangana, India. A total of 100 patients were included in the study, divided equally into two groups based on the treatment received. The following results were observed across various measured outcomes.

Healing time

The average healing time for patients in Group A (ORIF with plating) was 8 weeks, with a standard deviation of 1.5 weeks. In contrast, Group B (K-wires plus casting) had an average healing time of 9 weeks, with a standard deviation of 2 weeks. This indicates a slightly faster healing process for patients undergoing ORIF with plating (Table 1, Figures 1 and 2).

Rate of complications

The complication rates varied between the two groups. In Group A, 5% of patients experienced malunion, 4% had delayed union, 7% encountered surgical site infections, and 5% reported hardware irritation. Group B saw higher rates of malunion (12%) and delayed union (6%), but a lower incidence of surgical site infections (4%) and no typically observed hardware irritation(Table 2, Figures 3 and 4).

Functional recovery

At 6-month post-treatment, Group A patients demonstrated better functional recovery compared to Group B. Group A showed 93% recovery in grip strength and 88% in range of motion. Group B patients achieved 85% recovery in grip strength and 80% in range of motion, indicating superior functional outcomes for ORIF with plating (Table 3 and Figure 5).

Patient satisfaction scores

Patients in Group A reported a higher average satisfaction score of 8.5 out of 10, whereas Group B patients reported an average score of 7.5. This suggests greater overall satisfaction with the ORIF with the plating approach (Table 4 and Figure 6).

Pain levels during recovery

During the 1st month of recovery, Group A patients reported an average pain score of 5, which decreased to 2 by the 3rd month. Group B patients experienced higher pain levels, with an average score of 6 in the 1st month and 3 in

Table 1: Healing time

Treatment group	Average healing time (weeks)	SD (weeks)
Group A (ORIF with plating)	8	1.5
Group B (K-wires plus casting)	9	2

SD: Standard deviation, ORIF: Open reduction and internal fixation

Table 2: Rate of complications (percentage of patients)

Treatment group	Malunion (%)	Delayed union (%)	Surgical site infections (%)	Hardware irritation (%)
Group A (ORIF with plating)	5	4	7	5
Group B (K-wires plus casting)	12	6	4	Not typically observed

ORIF: Open reduction and internal fixation

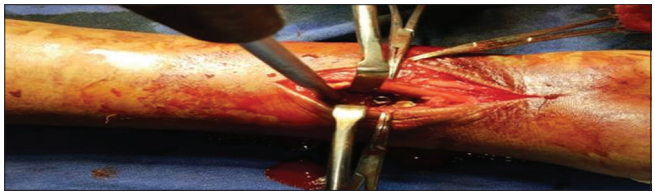

Figure 1: Distal radius plating

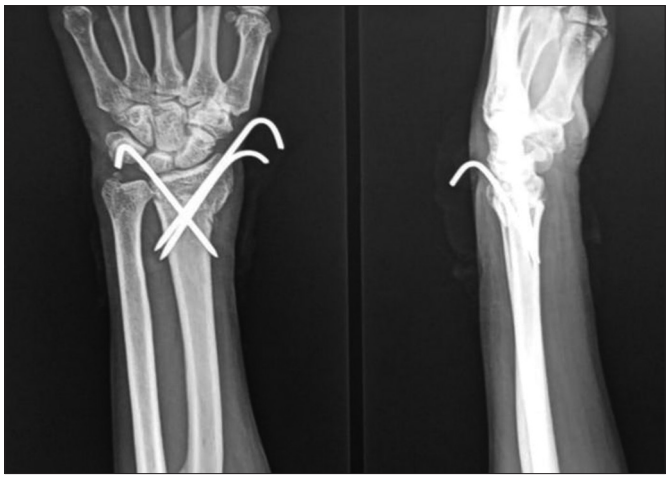

Figure 2: K wire for distal radius fracture

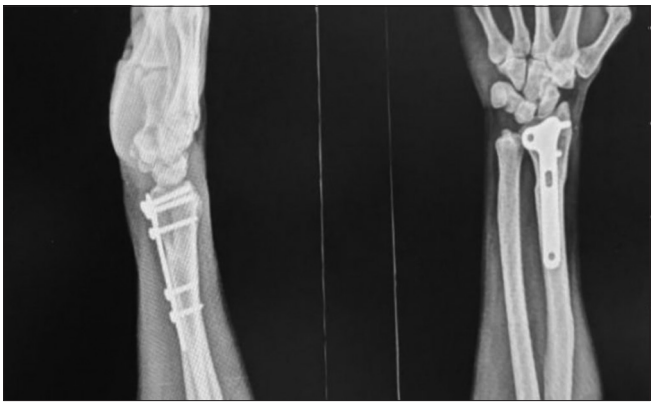

Figure 3: Open reduction and internal fixation with plating for distal radius fracture

Figure 4: K wire fixation with casting for distal end radius fracture

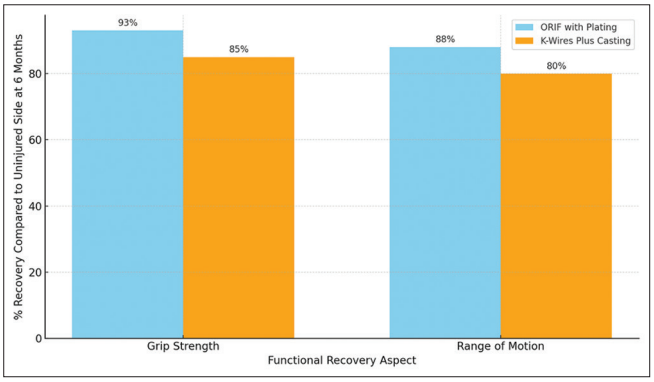

Figure 5: Functional recovery 6 months after treatment

the 3rd month, indicating more effective pain management in the ORIF with plating group (Table 5 and Figure 7).

Time to return to daily activities

The time required to return to daily activities was shorter for patients in Group A, averaging 8 weeks, compared to 10 weeks for patients in Group B. This suggests that ORIF with plating enables a quicker resumption of daily activities (Table 6).

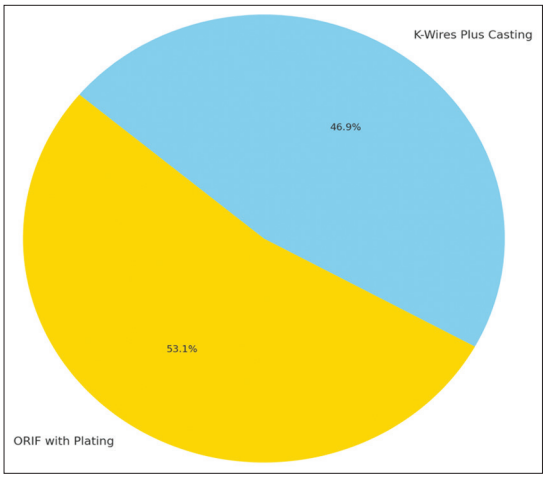

Figure 6: Patient satisfaction scores distribution

Table 3: Functional recovery (percentage recovery compared to uninjured side at 6 months)

Treatment group	Grip strength (%)	Range of motion (%)
Group A (ORIF with plating)	93	88
Group B (K-wires plus casting)	85	80

ORIF: Open reduction and internal fixation

Table 4: Patient satisfaction scores (out of 10)

Treatment group	Average score
Group A (ORIF with plating)	8.5
Group B (K-wires plus casting)	7.5

ORIF: Open reduction and internal fixation

Table 5: Pain levels during recovery (scale of 0–10)

Treatment group	Average pain score (1st month)	Average pain score (3rd month)
Group A (ORIF with plating)	5	2
Group B (K-wires plus casting)	6	3

ORIF: Open reduction and internal fixation

Table 6: Time to return to daily activities (weeks)

Treatment group	Average time
Group A (ORIF with plating)	8
Group B (K-wires plus casting)	10

ORIF: Open reduction and internal fixation

DISCUSSION

This retrospective cohort study meticulously compares the outcomes between two surgical interventions for distal radius fractures: ORIF with plating, and K-wires plus casting. By evaluating healing times, complication rates,

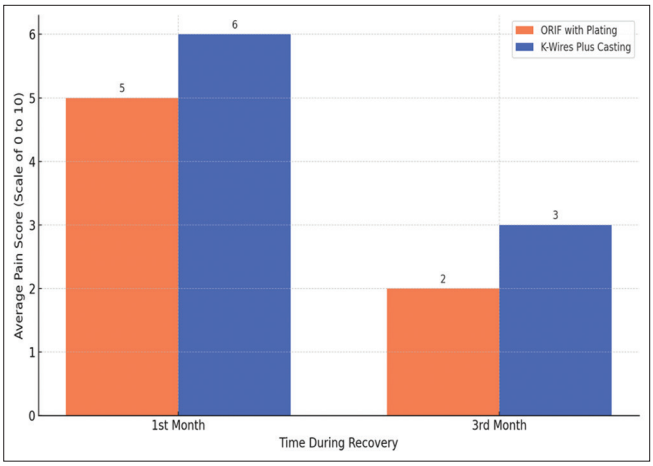

Figure 7: Pain levels during recovery

functional recovery, patient satisfaction, pain management, the timeline for resuming daily activities, and the associated costs of each method, this research makes a significant contribution to optimizing the treatment of this common orthopedic ailment.

One of the pivotal findings from our study is the notably shorter healing times observed in the group treated with ORIF with plating as opposed to those treated with K-wires plus casting. This observation aligns with the conclusions drawn by Franovic et al.,[8] emphasizing the expedited recovery process afforded by ORIF with plating, which inherently minimizes patient morbidity by enabling an earlier return to daily functions.

Moreover, the study highlights a decreased incidence of complications such as malunion and delayed union in the ORIF with the plating group. This outcome suggests a superior efficacy of this method in maintaining proper anatomical alignment and stability at the fracture site, a conclusion that resonates with the findings reported by Huang et al.[9] Furthermore, our analysis revealed enhanced functional recovery in patients undergoing ORIF with plating, marked by significant improvements in grip strength and range of motion. This aspect of recovery not only illustrates the clinical advantages of ORIF with plating but also correlates with increased patient satisfaction, as evidenced in our results and supported by Beeres et al.[10]

However, juxtaposing these benefits with the specific risks associated with the ORIF with a plating approach, including surgical site infections and hardware irritation, is crucial. These concerns underline the complexity of clinical decision-making, emphasizing the need for meticulous post-operative care strategies to mitigate complications and ensure favorable outcomes for patients (Franovic et al.;[8] Howell et al.[11]). This approach underscores the importance of carefully considering the balance between achieving optimal anatomical and functional recovery and managing the potential risks inherent to surgical interventions.

Our findings are corroborated by a broad spectrum of literature, including randomized clinical trials focusing on the efficacy of surgical plating in older patients (Lawson et al.[12]), systematic reviews on functional outcome measures for distal radius fractures (Norton et al.[13]), and comparative studies on various fixation techniques (Vaghela et al.[14]). This body of work collectively informs the ongoing discourse on the most effective and efficient treatment methodologies for distal radius fractures.

Limitations of the study

Notwithstanding, the retrospective design of our study introduces inherent biases and potential inaccuracies in data collection, potentially limiting the generalizability of our conclusions. In addition, the study's sample size, though reflective of treatment diversity, may not adequately represent the full range of patient outcomes, thus constraining the statistical power of our analyses.

CONCLUSION

The results of our study highlight the crucial significance of customizing treatment approaches for distal radius fractures in line with the specific requirements and conditions of each patient. The advantages of ORIF using plating are evident, as it results in reduced healing durations, enhanced functional recovery, and increased patient satisfaction. However, it is essential to take into account any potential risks associated to this surgical procedure. Therefore, the decision to undergo surgical intervention should be based on a thorough evaluation of these aspects, aiming to achieve optimal outcomes for patients.

ACKNOWLEDGMENT

The authors extend their gratitude to the staff of the Orthopedics Department for their continuous support during the study period. Special thanks to Professor and Head, Dr. Venkat Lakavath, for his invaluable help and support in this study.

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Authors' Contributions:
SK- Concept and design of the study, results interpretation, review of the literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of the manuscript; **VKG-** Concept and design of the study, results interpretation, review of the literature and preparing the first draft of the manuscript, revision of the manuscript; **RR-** Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation. revision of the manuscript. **MB-** Concept and design of the study, results interpretation, review of the literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of the manuscript.

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Source of Support: Nil, **Conflicts of Interest:** None declared.