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Study Of Fracture Of Distal End Of Radius.

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ABSTRACT

Distal radius fractures are among the most frequent orthopedic injuries, especially in older adults. Treatment varies widely, including conservative and surgical options, each with distinct outcomes. **Objective:** Our study aimed to assess the demographic distribution, treatment modalities, functional outcomes, and complications of distal radius fractures. This prospective observational study included 40 patients with distal radius fractures treated at a tertiary care hospital. Patients were managed either conservatively or surgically, with surgical options including closed reduction with percutaneous pinning, external fixation, or open reduction with internal fixation (ORIF). Functional outcomes were measured using the Disabilities of the Arm, Shoulder, and Hand (DASH) score, range of motion, and grip strength over a 12-week follow-up period. ORIF demonstrated the best outcomes in terms of union time (8 weeks), functional recovery, and range of motion, with minimal complications. Conservative treatment was effective for stable fractures but showed limited functional improvement. Percutaneous pinning and external fixation had higher complication rates, such as infection and pin loosening. Individualized treatment for distal radius fractures is essential. ORIF offers superior functional outcomes for complex fractures, while conservative management remains viable for stable fractures.

Keywords: Distal radius fracture, ORIF, DASH score

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INTRODUCTION

Fractures of the distal end of the radius are among the most common injuries, particularly in adults and the elderly, due to their high incidence following low-energy falls in individuals with osteoporotic bones [1]. This type of fracture is also prevalent among younger individuals, often resulting from high-energy trauma such as sports injuries, falls from heights, or motor vehicle accidents [2]. Distal radius fractures encompass a wide range of fracture patterns and severities, from simple extra-articular fractures to complex intra-articular fractures that involve the wrist joint, leading to potential long-term disability and functional impairment if not properly treated [3].

These fractures pose a significant clinical challenge, as they often affect wrist stability and alignment, which are crucial for hand function and daily activities. Management strategies for distal radius fractures have evolved significantly, ranging from conservative approaches like immobilization with a cast to various surgical options including closed reduction with percutaneous pinning, external fixation, and open reduction with internal fixation. Treatment choices are influenced by factors such as patient age, fracture type, and activity level [4, 5]. Despite advancements in surgical techniques and fixation devices, achieving optimal functional outcomes remains complex, necessitating individualized treatment approaches and a multidisciplinary focus on post-treatment rehabilitation.

METHODOLOGY

The study was conducted as a prospective observational study involving 40 patients diagnosed with fractures of the distal end of the radius. Patients were selected from the orthopedic department at a tertiary care hospital, and the inclusion criteria consisted of adults aged 18 and above who had sustained fractures of the distal radius confirmed by radiographic imaging. Exclusion criteria included patients with multiple fractures, those with prior surgery in the affected area, and individuals with severe comorbidities impacting recovery. Written informed consent was obtained from all participants, and ethical clearance was approved by the institutional review board.

Data collection involved a structured protocol starting with a detailed patient history and clinical examination to assess the extent and nature of the fracture. Radiographs were taken in standard posteroanterior, lateral, and oblique views to classify the fractures according to the AO classification system. This classification aided in identifying the fracture pattern and guided the choice of management. Additionally, demographic data, the mechanism of injury, and any associated injuries were recorded to understand the context and possible contributing factors to each case.

Following initial assessment, each patient received treatment based on the fracture type and clinical indications. Conservative treatment involved closed reduction and immobilization with a cast for stable fractures, while unstable or displaced fractures required surgical intervention. Surgical options included closed reduction with percutaneous pinning, external fixation, or open reduction with internal fixation using a volar locking plate. Post-operatively, patients were monitored for complications and were provided with instructions for immobilization, as well as guidance on initiating early movement when feasible to enhance recovery.

Outcome measures included radiographic union, wrist range of motion, grip strength, and functional recovery, assessed at regular follow-up intervals of 2-, 6-, and 12-weeks post-treatment. The Disabilities of the Arm, Shoulder, and Hand (DASH) score was used to evaluate functional outcomes and quality of life. Data were analyzed using SPSS software, with descriptive statistics summarizing baseline characteristics, and comparative analysis conducted to evaluate the effectiveness of conservative versus surgical interventions. The results contributed to understanding the factors affecting recovery and guided recommendations for managing distal radius fractures.

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RESULTS

Table 1: Baseline Characteristics of Study Participants (N=40).

Characteristic	Value
Age (Mean ± SD)	55.3 ± 15.2 years
Gender	Male: 18 (45%)
	Female: 22 (55%)
Mechanism of Injury	Fall from height: 16 (40%)
	Road traffic accident: 8 (20%)
	Low-energy fall: 16 (40%)
Fracture Classification (AO)	Type A: 20 (50%)
	Type B: 10 (25%)
	Type C: 10 (25%)

Table 2: Treatment Modality and Outcomes.

Treatment Method	Number of Patients (%)	Complications	Radiographic Union (Mean Weeks)
Conservative (Casting)	16 (40%)	2	8
Closed Reduction with Percutaneous Pinning	10 (25%)	3	10
External Fixation	6 (15%)	2	12
Open Reduction with Internal Fixation (ORIF)	8 (20%)	1	8

Table 3: Functional Outcomes Based on DASH Score at Different Follow-up Intervals.

Follow-up Interval	Mean DASH Score (Conservative)	Mean DASH Score (Surgical)
2 Weeks	70.5	68.2
6 Weeks	55.0	50.8
12 Weeks	30.5	25.6

Table 4: Range of Motion (ROM) and Grip Strength at 12 Weeks Post-Treatment.

Treatment Method	Wrist Flexion (Mean ± SD)	Wrist Extension (Mean ± SD)	Grip Strength (kg, Mean ± SD)
Conservative (Casting)	55.2° ± 10.5	60.3° ± 11.2	15.0 ± 4.5
Closed Reduction with Pinning	65.1° ± 9.8	68.0° ± 10.1	18.5 ± 3.8
External Fixation	58.0° ± 8.9	62.5° ± 9.7	16.0 ± 4.1
ORIF	70.4° ± 10.2	75.6° ± 10.7	20.0 ± 4.2

DISCUSSION

The study involved 40 participants with a mean age of 55.3 years, indicating a higher incidence of distal radius fractures in middle-aged to elderly populations. This demographic distribution is consistent with prior studies, which have shown that age is a critical risk factor due to decreased bone density and higher susceptibility to fractures. A slight female predominance was observed, with females constituting 55% of the study population. This may be attributed to post-menopausal osteoporosis, which increases fracture risk in women. The mechanism of injury was evenly distributed between low-energy falls and high-energy trauma, emphasizing the need for individualized treatment plans based on patient age, bone health, and activity level [6, 7].

Fracture classification, according to the AO system, revealed that Type A fractures were the most common, accounting for 50% of cases. Type A fractures typically represent extra-articular fractures, often treated conservatively in stable cases. Types B and C, which include more complex intra-articular fractures, accounted for 25% each and required more intensive intervention. This distribution highlights

that while extra-articular fractures are common, a significant portion of cases involve complex fracture patterns that demand specialized surgical techniques [8].

Treatment Modalities and Outcomes

The treatment approach for distal radius fractures in this study varied based on the fracture pattern and stability, with conservative casting employed in 40% of cases, closed reduction with percutaneous pinning in 25%, external fixation in 15%, and open reduction with internal fixation (ORIF) in 20%. Each treatment modality showed distinct outcomes in terms of complications, time to radiographic union, and functional recovery [9].

Patients treated conservatively with casting had a high union rate, with minimal complications and an average union time of 8 weeks. However, some patients experienced stiffness and delayed functional recovery, as indicated by relatively high DASH scores at 12 weeks. This finding aligns with prior research, which suggests that conservative treatment is effective for stable, minimally displaced fractures but may lead to reduced range of motion and grip strength compared to surgical interventions. Closed reduction with percutaneous pinning was associated with a slightly longer union time of 10 weeks and had complications in three cases, primarily due to pin tract infections. These complications underscore the need for careful post-procedural monitoring in percutaneous pinning to prevent infection and optimize outcomes.

External fixation was used primarily in cases with greater fracture instability, resulting in an average union time of 12 weeks. Two patients in this group experienced complications, including pin loosening and skin irritation. Despite these issues, external fixation provided adequate stabilization for complex fractures. However, the prolonged union time and complications indicate that while external fixation is effective for maintaining alignment, it may not be the optimal choice for all patients, especially those with skin sensitivity or limited tolerance for external devices. In contrast, ORIF demonstrated the most favorable outcomes in terms of union time, with an average of 8 weeks, and minimal complications. The volar locking plate used in ORIF provided stable fixation, allowing early mobilization and resulting in superior functional outcomes, as evidenced by lower DASH scores and improved grip strength.

Functional Outcomes and Range of Motion

Functional recovery was assessed using the DASH score at intervals of 2, 6, and 12 weeks, revealing significant differences in outcomes between conservative and surgical groups. Patients who underwent ORIF had consistently lower DASH scores across all intervals, indicating better functional recovery and quality of life. By the 12-week follow-up, ORIF patients achieved an average DASH score of 25.6, compared to 30.5 in the conservative group. This difference suggests that ORIF may offer advantages in cases where quicker return to daily activities is desired. Surgical options like ORIF also led to improved wrist flexion, extension, and grip strength, which are essential for performing daily tasks effectively. In contrast, conservative treatment, while effective for less severe fractures, showed limited improvement in range of motion, particularly in wrist flexion, as well as lower grip strength by the 12-week mark.

The difference in functional outcomes across treatment modalities highlights the importance of selecting an intervention that matches the fracture's complexity and the patient's lifestyle needs. Conservative management may suffice for lower-demand patients with stable fractures, while surgical options should be prioritized for active individuals or those with high functional requirements.

While each treatment modality has unique advantages, they also carry specific risks and complications. Conservative treatment, although non-invasive, may lead to residual stiffness and limited functional recovery in some patients. Closed reduction with pinning showed a risk of pin tract infection, a common concern in percutaneous procedures. External fixation, although effective for fracture stabilization, had complications related to pin loosening and skin irritation. ORIF presented the fewest complications, though it is associated with surgical risks, including potential soft tissue injury and infection.

These findings emphasize the need for careful preoperative evaluation and postoperative care tailored to each patient's treatment modality. Complications, while generally manageable, can impact

recovery and functional outcomes if not promptly addressed. Hence, patient education on the importance of follow-up care, adherence to rehabilitation protocols, and early detection of complications is essential.

CONCLUSION

Our study underscores the significance of individualized treatment planning in managing distal radius fractures. While conservative treatment is effective for stable fractures, surgical interventions, particularly ORIF, provide superior functional outcomes and faster recovery, especially for complex fractures or active individuals. The choice of treatment should consider factors such as fracture type, patient age, activity level, and risk tolerance for surgical complications. Given the high functional demands of the wrist, post-treatment rehabilitation plays a crucial role in optimizing outcomes across all treatment modalities. Future studies with larger sample sizes and longer follow-up periods could further validate these findings and provide additional guidance on refining treatment protocols.

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