



ORIGINAL ARTICLE

## Functional outcome of distal radius fractures in adults after conservative treatment.

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**ABSTRACT... Objective:** To determine the frequency of functional outcome after conservative treatment in patients with distal radius fractures presenting to Hayatabad Medical Complex, Peshawar. **Study Design:** Descriptive Case Series. **Setting:** Department of Orthopedics, Hayatabad Medical Complex, Peshawar. **Period:** 1<sup>st</sup> January 2022 to 30<sup>th</sup> June 2022. **Methods:** A total of 137 patients of both gender with distal radius fracture were included in the study. A Basic demographics (age, gender, duration of fracture and weight on weighing scale) were recorded. At the end of 6 weeks, the plaster cast was removed and functional outcome examinations was made. Functional outcome was noted using demerit point system of Gartland and Werley. **Results:** Age range in this study was from 18 to 70 years with mean age of  $44.153 \pm 8.19$  years, mean duration of complain  $26.708 \pm 4.18$  hours and mean weight was  $80.343 \pm 7.05$  Kg. Male patients were 70.8% and females were 29.2%. Excellent functional outcome was seen in 33.6% patients, good 14.6%, fair 34.3% and poor was 17.5%. **Conclusion:** Our study concluded that conservative management of the distal radius fractures in plaster cast is an effective treatment modality achieving satisfactory results.

**Key words:** Conservative Treatment, Distal Radius Fractures, Functional Outcome.

### INTRODUCTION

Fractures of the distal radius (DR) can occur as a consequence of various traumatic events affecting the forearm. Commonly encountered isolated DR fractures encompass Smith's fractures, Colle's fractures, Torus/Buckle fractures, Greenstick fractures, Die-punch fractures, and fractures occurring solely in the radius shaft.<sup>1</sup> The majority of these fractures are typically associated with incidents where individuals fall onto an outstretched hand and sustain injuries. In the case of elderly individuals, distal radius (DR) fractures often stem from low-energy falls that occur when they are standing or seated.<sup>2</sup> These fractures commonly manifest as comminuted and intra-articular injuries, frequently deviating from the conventional eponymous classification. In children and adolescents, isolated distal radius (DR) fractures more commonly occur due to high-energy incidents such as falls during play or while participating in sports activities.<sup>3</sup>

Distal radius (DR) fractures can also manifest as more intricate injury patterns, including Galeazzi fracture-dislocations, fractures involving both bones of the forearm, fractures of the radius styloid, as well as Barton's and Chauffeur's fractures. The mechanisms underlying these fractures are often more multifaceted or divergent compared to those associated with isolated DR fractures.<sup>4</sup> Individuals diagnosed with distal radius fractures frequently report experiencing post-traumatic pain in the distal upper extremity. Moreover, distal radius (DR) fractures can be encountered within the context of a broader presentation involving multiple traumatic injuries.<sup>5</sup> In both scenarios, it is crucial to avoid fixating solely on an apparent distal radius (DR) injury and instead conduct a comprehensive assessment for potential life-threatening injuries or underlying issues. Various treatment approaches, including conservative methods such as casting and surgical interventions like open reduction internal fixation, external fixation, intramedullary fixation, or

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percutaneous pinning, have been recommended and demonstrated success in the management of distal radius fractures.<sup>6,7</sup>

A previous meta-analysis showed that surgery and non-surgical treatment both had their own advantages and disadvantages.<sup>8</sup> A recently conducted meta-analysis, as per its findings, did not identify any notable differences in most functional assessments when comparing surgical and nonsurgical approaches for managing distal radius fractures. Consequently, the authors of the study concluded that primary consideration should be given to nonsurgical treatments for distal radius fractures, and the decision to opt for operative fixation should be made judiciously, taking into account specific indications.<sup>9</sup> In a study conducted by Keleş G. et al., the results indicated that, following conservative treatment for distal radius fractures, the frequency of achieving excellent functional outcomes was 45.1%, while 37.3% of cases achieved a good outcome, and 17.6% of cases attained a fair outcome.<sup>10</sup> In another study conducted by Subash Y. et al., the findings revealed that, following conservative treatment for distal radius fractures, the frequency of excellent functional outcomes was 30%, with 15% achieving a good outcome, 35% attaining a fair outcome, and 20% experiencing a poor functional outcome.<sup>11</sup>

No single treatment is the solution for each type of fracture in every patient. Based on the functional anatomy in different populations, we planned to get data in our local population by determining the frequency of functional outcome after conservative treatment in patients with distal radius fractures presenting to Hayatabad Medical Complex, Peshawar. The objective of our study was to determine the functional outcome in distal radius fractures after conservative management.

## METHODS

This Descriptive study of 137 patients was performed in Department of Orthopedics, Hayatabad Medical Complex, Peshawar from 1st Jan 2022 to 30<sup>th</sup> June 2022. Sample size was calculated with WHO sample size calculator, using 95% confidence interval, 6% margin of error and

expected prevalence of good functional outcome by 15% after conservative treatment of distal radius fractures.<sup>11</sup> Data was collected using Non-probability consecutive sampling technique after ethical approval (Ref.78/OrthoB/HMC). Patient of both gender with age between 18 to 70 years with distal radius fracture of less than 48 hours duration was included in our study. While patient with open fractures, neurovascular injuries, poly trauma or bilateral fractures and those lose follow up were excluded from our study.

## Data Collection Procedure

Patients fulfilling the inclusion criteria was included in the study after permission from ethical committee. Informed consent was taken after explaining the risk and benefits of the study to participants. Basic demographics (age, gender, duration of fracture and weight on weighing scale) was recorded. In the process of reducing distal radius fractures in patients, analgesia was administered to manage pain. A single dose of intramuscular Diclofenac sodium was given to the patients. The reduction process was carried out while the patient was positioned in a supine posture, and the affected arm was extended in an abducted position with the elbow flexed at a 90-degree angle. This procedure involved the collaboration of two individuals: one responsible for providing counter-traction above the elbow, and the other administering traction by holding the thumb with one hand and the remaining four fingers with the other. After maintaining continuous traction for a duration of 2-3 minutes, the reduction maneuver was executed, taking into account the specific fracture type and the estimated injury mechanism. Subsequently, all patients received an above-the-elbow brace designed to allow movement of the metacarpophalangeal joint. During this stage, it's important to note that the standard wrist position was not employed. Instead, care was taken to apply the brace in the position in which the reduction had been achieved. After the reduction procedure, post-reduction radiography was conducted to ensure that the reduction was within acceptable parameters.

Patients were scheduled for a follow-up appointment one day later. During this follow-up,

they were informed about potential brace-related complications and the possibility of developing compartment syndrome. In cases where the swelling had decreased, an above-the-elbow plaster cast was applied, and radiography was repeated after the cast application to assess the outcome of the procedure. For patients who continued to experience swelling, the importance of elevation was emphasized, and they were scheduled for frequent follow-up appointments until the swelling subsided. Once the edema had sufficiently reduced, the procedure involving the application of a circular plaster cast was performed. After the circular plaster cast was applied, patients received instruction on the importance of maintaining proper circulation and elevation of the affected limb. A follow-up appointment was arranged for them two days later to assess and monitor circulation. Patients who demonstrated adequate circulation underwent follow-up radiographs after a period of four weeks. Following this assessment, the plaster cast was removed, extending down to below the elbow. This specific protocol was followed for a duration of two weeks. At this stage, patients were advised to initiate elbow exercises. After a total of six weeks, the plaster cast was removed, and functional outcome assessments were conducted. Functional outcome was noted using demerit point system of Gartland and Werley<sup>12</sup> which show Excellent functional outcome with a points of 0-3, Good functional outcome on 4-9 points and Fair functional outcome on 10-15 and Poor outcome on 16-26 and recorded on especially designed proforma.

### Data Analysis

Data was entered and analyzed using SPSS 22 software. Quantitative variables like age, duration of fracture, weight was measured as mean and standard deviation. Categorical variables like gender and functional outcome was measured in terms of frequency percentages. Functional outcome was stratified by age, gender, duration of fracture and weight. Post stratification chi square test was applied  $p \leq 0.05$  was considered statistically significant.

## RESULTS

Our study comprises of 137 patients with minimum age of 18 years and maximum age of 70 years with mean age of  $44.153 \pm 8.19$  years, mean duration of complain  $26.708 \pm 4.18$  hours and mean weight was  $80.343 \pm 7.05$  Kg. Male patients were 97(70.8%) and females were 40(29.2%). Excellent functional outcome was seen in 33.6% patients, good 14.6%, fair 34.3% and poor was 17.5%.

Results	Point
<b>Residual deformity (range, 0 to 3 points)</b>	
Prominent ulnar styloid	1
Residual dorsal tilt	2
Radial deviation of hand	2 or 3
<b>Subjective evaluation (range, 0 to 6 points)</b>	
Excellent: no pain, disability, or limitation of motion	0
Good: Occasional pain, slight limitation of motion, and no disability	2
Fair: occasional pain, some limitation of motion, feeling of weakness in wrist, no particular disability if careful, and activities slightly restricted	4
Poor: pain, limitation of motion, disability, and activities more or less markedly restricted	6
<b>Objective evaluation* (range, 0 to 5 points)</b>	
Loss of extension	5
Loss of ulnar deviation	3
Loss of supination	2
Loss of flexion	1
Loss of radial deviation	1
Loss of circumduction	1
Pain in distal radio-ulnar joint	1
Grip strength: 60% or less than on the opposite side	1
Loss of pronation	2
<b>Complications (range, 0 to 5 points)</b>	
<b>Arthritic Change</b>	
Minimum	1
Minimum with pain	3
Moderate	2
Moderate with pain	4
Severe	3
Severe with pain	5
<b>Nerve complications (median)</b>	1-3
Poor finger function due to cast	1 or 2
<b>Final results (ranges of points)</b>	
Excellent	0-2
Good	3-8
Fair	9-20
Poor	$\geq 21$

Table-I. Demerit point system of gartland and werley

Functional Outcome	n(%)
Excellent	46(33.6)
Good	20(14.6)
Fair	47(34.3)
Poor	24(17.5)

**Table-II. Functional outcome after conservative management**

Variables		Functional Outcome			
		Excellent	Good	Fair	Poor
Age	18-50	36 (36%)	6 (16.7%)	34 (34%)	15 (15%)
	51-70	10 (27%)	14 (13.9%)	13 (35.1%)	9 (24.3%)
Gender	Male	32 (33%)	13 (13.4%)	34 (35.1%)	18 (18.6%)
	Female	14 (35%)	7 (17.5%)	13 (32.5%)	6 (15%)

**Table-III. Correlation of functional outcome with age and gender**

**DISCUSSION**

Distal radius fractures are frequently encountered injuries in both outpatient and emergency department settings. Numerous studies documented in the literature have emphasized the significance of achieving an anatomically precise reduction in order to attain a favorable functional outcome.<sup>13,14</sup> It's worth noting that fractures in which essential factors such as articular surface congruency, maintenance of radial height, length, and inclination have not been adequately addressed are generally linked to suboptimal outcomes<sup>15</sup>

Therefore, it is essential to make thorough efforts to restore these parameters to the highest achievable degree of accuracy. Subsequent to achieving a successful anatomic reduction, a variety of methodologies are available for maintaining alignment and averting any potential loss of reduction. Each of these approaches comes with its own set of merits and demerits. Historically, the conventional approach to treating distal radius fractures has involved closed manipulative reduction followed by immobilization using a cast. Although cast immobilization offers the advantage of avoiding surgical intervention and its attendant complications, its applicability is limited in cases characterized by extensive

comminution of the fracture.<sup>16</sup> In our study Mean age was 44.153±8.19 years which compares well to a study by Ali R et al who reported almost similar incidence of age.<sup>17</sup> The best outcome or results were seen among the younger individuals. The excellent and good outcomes were seen only in stable, minimally comminuted and minimally displaced fracture patterns. Average time fracture union was around 3 months in this study. Delayed union was more frequently observed among postmenopausal females and older males. These observations align with the findings reported in a study conducted by Hirashima et al.<sup>18</sup>

Interestingly, the percentage of lost range of motion did not exhibit a strong correlation with the duration of union. Surprisingly, even patients with a union time of 6 weeks experienced a higher percentage of movement loss, whereas those with a union time of 3 months demonstrated a more favorable range of motion. Similarly, the assessment of pain and function scores at the 6-month follow-up did not exhibit a significant correlation with the duration of union. Excellent functional outcome was seen in 33.6% patients, good 14.6%, fair 34.3% and poor was 17.5%. These results were comparable to a study by Arora et al.<sup>19</sup>

In a study by Keleş G, et al. has shown that frequency of excellent functional outcome was 45.1%, good 37.3% and fair was 17.6% after conservative treatment of distal radius fractures.<sup>10</sup> In a study by Subash Y, et al. has shown in another study that frequency of excellent functional outcome was 30%, good 15%, fair 35% and poor was 20% after conservative treatment of distal radius fractures.<sup>11</sup> Koenig and colleagues conducted a comparative investigation assessing both conservative and surgical management approaches. Their study yielded the conclusion that open reduction and internal fixation with locking compression plates not only results in a higher rate of union but also leads to a superior functional outcome when contrasted with the use of casting in the treatment of these fractures.<sup>20</sup> It's important to note that non-operative treatment, on the other hand, appears to be a more suitable choice for elderly individuals with compromised



bone density. In a study conducted by Mishra RK et al, long term follow up are better with volar buttress plate in term of grip strength.<sup>21</sup> We meticulously reviewed and compared our own observations and conclusions with the findings documented by other authors.

Our analysis indicated that conservative management proves optimal for handling undisplaced, minimally comminuted fractures and fractures exhibiting minimal initial displacement. In cases characterized by minimal comminution, the use of K-wires, in conjunction with plaster slabs or casts, yielded superior results. External fixator application was deemed a more suitable approach for highly comminuted fractures, where screw purchase for reconstruction was unattainable. For Barton fractures and comminuted fractures amenable to articular reconstruction, open reduction and internal fixation with locking compression plates demonstrated improved outcomes. Consequently, the selection of the most appropriate treatment approach should be individualized, considering various factors, including the patient's age, bone quality, fracture pattern, initial displacement degree, and the extent of comminution. Precise restoration of the articular surface, encompassing parameters like radial height, length, and inclination, is integral to effective fracture management. Moreover, early and rigorous physiotherapy is often associated with favorable functional outcomes.

## CONCLUSION

Based on the findings of our study, it is evident that conservative management proves to be the superior approach for handling undisplaced, minimally comminuted fractures and fractures characterized by minimal initial displacement. Employing conservative management, which involves the use of a plaster cast, represents an effective treatment modality that achieves favorable outcomes both in terms of functional and anatomical aspects. Notably, our results indicate that the functional outcomes tend to surpass the anatomical outcomes in terms of overall patient satisfaction.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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




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2	Muhammad Iqbal	Data collection + Statistical analysis.	
3	Muhammad Khuzaima Shah	Manuscript writing.	
4	Ahsan Rafi	Statistical analysis.	
5	Mian Muhammad Saif	Proof reading.	
6	Sabir Khan Khattak	Proof reading + Statistical analysis.	