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# COMPARITIVE STUDY OF FUNCTIONAL OUTCOME WITH RADIOLOGICAL PARAMETERS IN SURGICALLY MANAGED DISTAL END RADIUS FRACTURE: A RETROSPECTIVE STUDY

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## ABSTRACT

**PURPOSE:** Distal end radius fractures are among the most common fractures and accounts for 15-20%of orthopaedic admissions in hospitals[1]. Though there are various treatment options described so far; still there is lacunae in the literature, regarding accurate treatment modality, particularly in case of unstable fractures.

Objective of the study is to examine the association of post operative radiographic parameters of distal end radius fracture and functional outcome[2].

**METHODOLOGY:** This retrospective study included the study on surgically managed DER fractures, presenting at Karwar institute of medical sciences from nov2023-june2024.

Both intra-articular and extra-articular fractures are included. Objectively by assessing Radiological parameters;and the wrist function by measuring the ROM and hand-grip strength.

Subjective assessment was done using DASH score.

Sample size is(64), males(38), female(26). operations such as ORIF with plating(64%), CRIF with percutaneous pinning(28%), External fixator(8%) were used.

**RESULTS:** Majority of patients had a good radiographic score(68%), while 7% had a poor score. Dorsal angulation of <5 degree, Radial height of <8mm, radial inclination of <15 degree, positive ulnar variance these parameters has poor

outcomes. dorsal angulation significantly impact on functional impairment compared to other factors. Grip strength was a significant predictor of DASHSCORE.

**CONCLUSION:** Patients Radiographic score correlated positively with the objective functional score, especially in younger patients;age is an important factor for planning of treatment options**.** DER fractures have a nonlinear relationship with dorsal tilt, with worse outcomes being associated with increasing dorsal tilt.

## INTRODUCTION

Distal radius fractures (DRF) are among the most common orthopaedic injuries, representing 15% to 20% of total fractures treated in hospitals[1]. DISTAL RADIUS fracture treatment has been assessed radiologically , and functionally using range of motion and grip strength. Nowadays, patient-reported outcome measures are commonly used, in particular the Disability of the Arm, Shoulder, and Hand (DASH) questionnaire.

There is no definite clinical evidence for the superiority of one particular treatment over another in patients with distal radius fracture. Although surgeon's preference and fracture characteristics still influence therapeutic decision making, in most cases surgical treatment is guided by radiological reduction criteria. In displaced distal radius fractures with an unacceptable closed reduction , open reduction and internal fixation is increasingly being carried out because anatomic reduction is positively related to functional outcome.[3][4][5]

Epidemiologic studies have reported a high incidence in white populations[6], especially among elderly patients.. The most frequent radiological parameters for evaluating extra-articular DRF reduction include radial inclination, radial height, volar tilt, ulnar variance, and articular step off[7][8][9].

## MATERIALS AND METHODS Study design and sample size

This correlational study was done retrospectively. We studied (64) patients of age 20 to 75 years, Male-(38) Female-(26), with distal end radius fracture treated by surgically in department of orthopaedics at Karwar institute of medical sciences from November 2023 to June 2024. The diagnosis was performed by an orthopaedic surgeon, based on clinical presentation and radiological results. The initial closed reduction was performed under the supervision of the resident orthopaedic surgeon; The patients who visited the hospital with intra-articular and extra articular distal radius fractures, who had been managed conservatively or surgically and came for follow- up (at least six months) were taken up for study after taking consent from them for the study. Check x rays of the affected wrist in

anteroposterior and lateral views were taken. palmar tilt, radial inclination, radial length and ulnar variance were analyzed. Fracture classification was done based on according to Frykmans[10] and AO classification[10], then we did surgery according to that. later referred for physical therapy.

**Functional assessment:** By assessing wrist movements such as

Palmar flexion ( normal : 0-80 degrees)

Dorsiflexion (normal : 0-70 degrees)

Radial deviation (normal: 0-20 degrees)
Ulnar deviation (normal : 0-35 degrees)

Supination (normal: 0-80 degrees)
Pronation (normal: 0-90 degrees)
DASH SCORE – it includes 30 Questionerries

**Inclusion Criteria:**

Male and female patients of age between 20 years and 75 years witb extraarticular and intraarticular distal end radius fracture

**Exclusion criteria:**

- patients with open fractures
- associated nerve injuries
- associated radial and ulnar shaft fracture
- carpal instability

**TABLE 1: SURGICAL PROCEDURES**

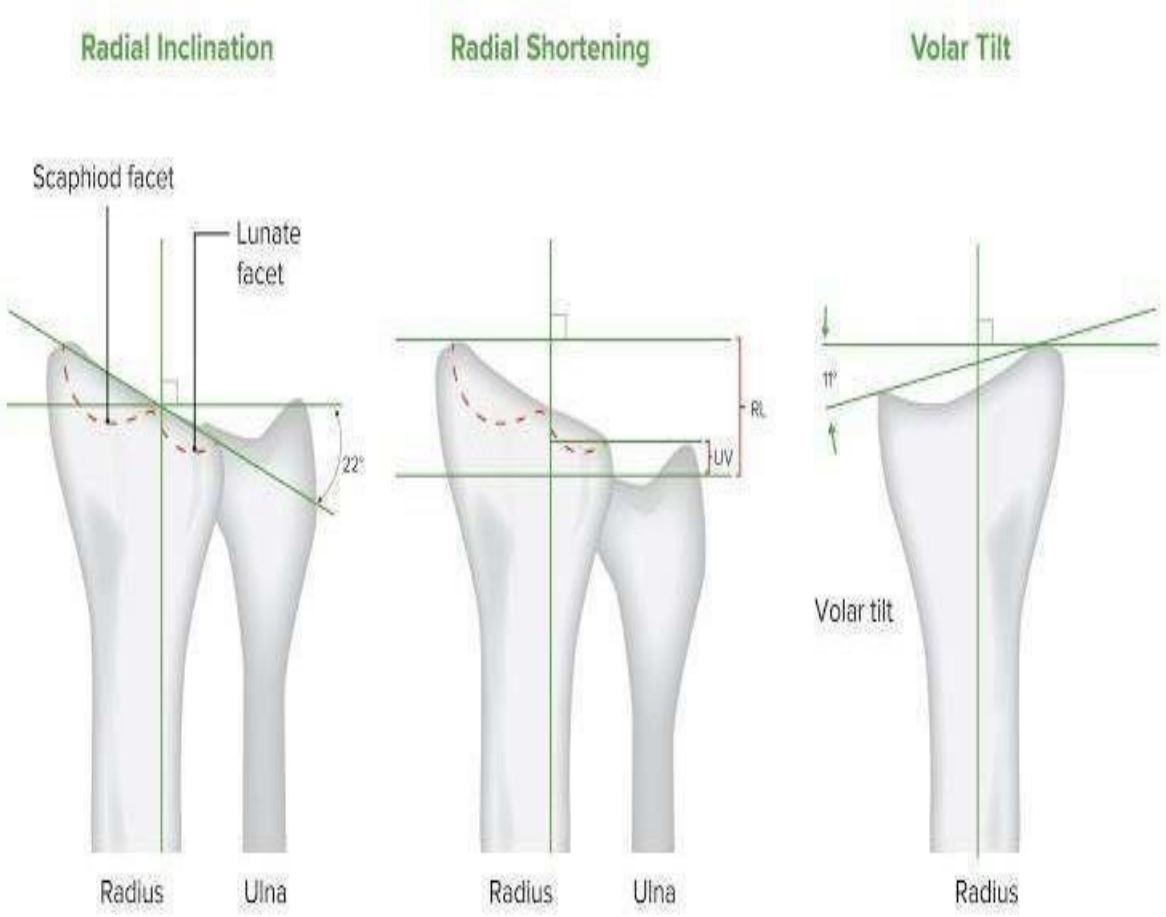
| SURGERY | NO. OF CASES | PERCENTAGE |
|---|---|---|
| ORIF WITH PLATING | **40** | **64%** |
| CRIF WITH PERCUTANEOUS PINNING | **18** | **28%** |
| CRIF WITH EX- FIXATION | **6** | **8%** |

**Measurement of radiological parameters**

After surgical treatment, each patient underwent a radiological evaluation to assess the results of the orthopaedic reduction. Consisting of standardized radiographs in 2 planes; the posterior- anterior view was performed with the patient at 90° of arm abduction, with 90° elbow flexion, and wrist in pronation.

In the case of the "true" lateral view, this was performed with the patient arm adducted against the trunk, elbow flexed 90°, forearm held in neutral rotation (no pronation or supination), and the wrist in neutral position (no radial or ulnar deviation, and no palmar or dorsal flexion). The third metacarpal shaft is parallel to the long axis of the radius.

The normal radiological parameters:



Based on the study published by Greewal and MacDermid[11] radial inclination (normal: 21°-23°) radial height (normal: 10-12mm) volar tilt (normal: 7°-15°), ulnar variance (normal: 0.7-1.5 mm), articular step-off (normal: 0-1 mm).[12]

**STATISTICAL ANALYSIS TABLE 2 : DEMOGAPHIC DETAILS**

| CHARACTERSTICS | VALUE |
|---|---|
| AGE RANGE | 20 – 75 years |
| MEAN AGE | 42 |
| GENDER | M- 38<br>F- 26 |

TABLE 3: FRACTURE CHARACTERSTICS

| FRACTURE TYPE | CLOSED | OPEN | TOTAL |
|---|---|---|---|
| EXTRA ARTICUAR | **40 (100%)** | **0** | **40 (62%)** |
| INTA ARTICULAR | **24 (100%)** | **0** | **24 (38%)** |

| | | | |
|---|---|---|---|
| 1) VOLAR BARTON | **22 (100%)** | **0** | **22 (34%)** |
| 2)DORSAL BARTON | **2 (100%)** | **0** | **2 (3%)** |

**Correlation of percentage loss of movements with radiological parameters, Table 4:**

| Percentage Of loss of movements | Radial length | Radial inclination | Dorsal tilt | Ulnar variance |
|---|---|---|---|---|
| 0-25 % | **8 to 10 mm** | **16 to 20 degree** | **0 to 5 degree** | **neutral** |
| 0-50% | **6 to 8 mm** | **10 to 16 degree** | **>5 degree** | **Positive variance >1mm** |
| 50-75% | **2 to 4 mm** | **5 to 10 degree** | **>5 degree** | **+ve more 2mm** |
| 75-100% | **<2 mm** | **0 to 5 degree** | **>5 degree** | **> +2mm** |

**Correlation of results with number of radiological parameters affected**

**TABLE 5:**

| No of radiological parameters | Poor result (n=4) | Fair result (n=12) | Good result (n=18) | Excellent resu (n=28) |
|---|---|---|---|---|
| Zero | _ | _ | 8 | 18 |
| One | _ | 2 | 6 | 8 |
| Two | _ | 3 | 4 | 2 |
| Three | 2 | 4 | 0 | 0 |
| four | 2 | 3 | 0 | 0 |
| Total | 4 (6%) | 12 (19%) | 18 (28%) | 28 (44%) |

**DISCUSSION**

Distal end radius fracture is the most common fracture in upper limb.

Here in this study how radiological parameters affects the individual functions of the wrist has been explained, in this retrospective analysis of 64 patients Male (n -38) ,female(n-26). Mean age is 42 years

In that 64% underwent ORIF with plating ,18% underwent CRIF with percutaneous pinning, 8% with CRIF with ex fixation .In this study dorsal tilt of >5degre which affects the palmar flexion movement and it hampers the daily activities , neutral tilt is acceptable it won't affects the function much . radial height of <8 mm affects the function much such as dorsiflexion and radial deviate on it leads to decreases in the fine skills of the hand such as hand grip. Neutral ulnar variance is acceptable but

positive variance affects the deviations of hand and also supination and pronation.
Radial inclination of <12mm has poor
functional outcome it affects mainly radial deviation

**CLINICAL CASE DISCUSSION**

CASE-1

X-ray1a x-ray 1b

**lat view**- dorsal tilt of 7 degree

**Ap view :**

Radial height – 15mm

Radial inclination – 18 degree

Ulnar variance – neutral

**FUNCTIONAL ASSESSMENT :**

palmar flexion -30degree

Dorsiflexion – 80 degree

Supination- 30 degree

Fig (1-A) (1-B) (1-c)

Here palmar flexion is affected more because of dorsal tilt and also it affects supination of forearm

CASE -2

**RADIOLOGICAL PARAMETERS** (FIG -2)

Fig (3 -A) FIG (3-B)

In (FIG-2) radial height is <2mm ,radial inclination is < 5 degree, positive ulnar variance with functional outcome of palmar flexion 60 degree dorsiflexion is normal

CASE-3

Here is the 48 years old lady presented with extraarticular DER fracture

SX- CRIF WITH PERCUTANEOUS PINNING was done 3 months back the she presented with osteopaenia radiologically and clinically complaining of severe pain these features suggestive of CRPS syndrome


**Fig – 4**
Dorsal tilt – neutral radial height - <2mm

Positive ulnar variance

Radial inclination- <12 degrees

Here the dorsiflexion ,radial deviation ,ulnar deviation and supination restricted, hand grip and strength are decrease

Among these methods plating has better outcome than other technique it mainly depends on type of fracture, 1 patients of ex fix and other patients of CRIF with percutaneous pinning shows CRPS syndrome, 9 cases presents with malunion most commonly associated with ORIF WITH PLATING procedure.

**Complications:**

Malunion was seen in 20% cases. Mal-union was seen in case of fractures with more comminution, more displacement.

CRPS SYNDROME -malunion along with comorbidities such as hypertension, diabetes prone for CRPS

**CONCLUSION:** Patients Radiographic score correlated positively with the objective functional score, especially in younger patients;some studies disagree with radiological parameters affecting functional outcome [13][14][15], age is an important factor for planning of treatment options**.** Dorsal tilt of more than 5 degrees , radial height of less than 6 mm , radial inclination of <12 degree positive ulnar variance has poor fuctional outcome . if 4 radiological parameters as mentioned above then it affects the complete range of motion of the joint.

DER fractures have a nonlinear relationship with dorsal tilt, with worse outcomes being associated with increasing dorsal tilt.

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