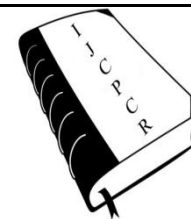




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## FUNCTIONAL EVALUATION OF FRACTURE OF DISTAL RADIUS TREATED BY EXTERNAL FIXATOR CUM DISTRACTOR

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### ABSTRACT

Distal radius fracture firstly was described by Sir Abraham Colles. To achieve better functional outcome anatomic restoration is must. Principle behind external fixation is “Ligamentotaxis” meaning maintainance of reduction by continuous distraction. Functional evaluation being done by evaluating range of movements. Closed reduction and cast immobilization is the most favourable method of treatment, acceptable reduction can be obtained by cast but is difficult to safely maintain reduction with cast immobilization. Study consisted of 40 patients. Group A with 20 patients treated using closed reduction and external fixator and group B with 20 patients treated by closed reduction and cast immobilization. Functional results in group A were excellent and good in 95% and fair in 5%, where in conservative group results were excellent and good in 70%. Group B had more average loss of dorsiflexion, palmar flexion, radial deviation, ulnar deviation and supination/pronation. Most significantly altered movement was supination. Complications like residual pain, restriction of finger movements, residual deformity, prominent ulnar styloid were more common in conservative group as compared to external fixator group. The external fixator proved to be a simple, reliable and effective modality for treatment of distal radius fracture for maintainance of reduction and meet the functional demands of young patients.

**Key words:** External fixator, Distal radius fracture, Ligamentotaxis, Functional evaluation.

### INTRODUCTION

The fracture distal radius was described firstly by Sir Abraham Colles in 1814 who stated that “ The limb will at some remote period again enjoy perfect freedom in all movements and be completely exempted from pain but deformity will be undiminishable through out life” [1]. Previously all distal end radius fractures were called as Colles’ fracture but this was the oversimplification of very complex fracture. Classical colles’ fracture was defined as metaphyseal injury within 2 cm of the articular surface of the distal radius with dorsal angulation [2]. Malunion, residual deformity and restriction of movement was the rule at that time and long after in the treatment outcome of distal radius fracture . Fracture distal radius is associated

with high energy trauma in young adults with definable functional demands and if articular anatomy is not restored within reasonable degree of congruency, those associated with shearing type fracture dislocation may lead to significant functional disability. Keeping in the mind the complexity of distal radius fracture and functional demands we applied external fixator cum distractor in this fracture. The principle behind external fixation is the maintainance of reduction by continuous distraction commonly termed “Ligamentotaxis” [3]. Functional evaluation was done by observing range of flexion, extension, radial deviation, ulnar deviation, supination and pronation.

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Though closed reduction and cast immobilization is the most favourable method of treatment, acceptable reduction can be obtained by cast but it is often difficult to safely maintain the reduction with cast immobilization.

**MATERIAL AND METHOD**

This prospective study was conducted in the Department of Orthopaedics.

Group A- 20 patients treated by closed reduction and external fixator cum distractor was applied.

Group B- 20 patients treated by closed reduction and cast immobilization.

Patients subjected to-

- Standard AP and lateral radiograph of wrist with distal forearm
- Radiograph of normal wrist
- Classified according to Frykman classification
- Broad spectrum i.v antibiotics before start of surgery to group A

Surgery performed under suitable anesthesia. The first schanz screw of 2.00 mm passed through second metacarpal on the radial side, the second schanz screw of 3.5 mm passed on radial side of the radius. Once closed reduction achieved pins are connected to the stabilizing rods, the second schanz screws in second metacarpal and forearm passed and clamps were tightened by Allen keys. Pin site dressing done and radiographs were taken post operatively. Patient discharged after 1-3 days of observation. Patients were followed up clinically and radiologically regularly and evaluated for functional and functional outcome after 6 months.

Group B : cast removed after consolidation of the fracture site seen on radiograph and patients were evaluated at the end of 6 months.

**Assessment of functional end result:**

Functional end result were analysed subjectively by questionnaire and objectively by noting range of motion, grip strength and functional capacity in both the groups by criteria based on Sarmento et al [4]:

<b>Point range: 0 to 3. Prominent residual deformity-1, Residual dorsal tilt-2: Radial elevation of hand-2 to 3.</b>		
<b>Subjective</b>	<b>Evaluation</b>	<b>Score</b>
Excellent	No pain or limitation of movement	0
Good	Occasional pain, slight limitation of motion, no disability	2
Fair	Occasional pain, slight limitation of motion, feeling of weakness in wrist. No particular disability if careful, activities slightly restricted	4
Poor	Pain, limitation of motion, disability, activities more or less markedly restricted	6
<b>Point range 0 to 6</b>		
Loss of dorsiflexion	less than 45°	5
Loss of deviation	less than 15°	3
Loss of supination	less than 50°	2
Loss of palmar flexion	less than 30°	1
Loss of radial deviation	less than 30°	1
Loss of circumduction	loss	1
Pain in distal radio ulnar joint	present	1
Grip strength	<60% of opp. Side	1
Loss of pronation	less than 50°	2
<b>Point range- 0 to 5</b>		

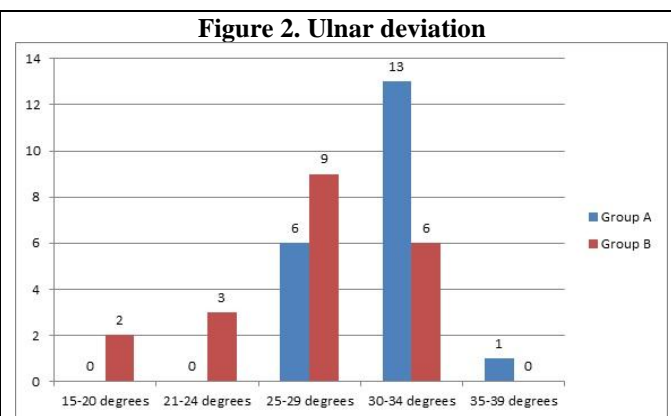
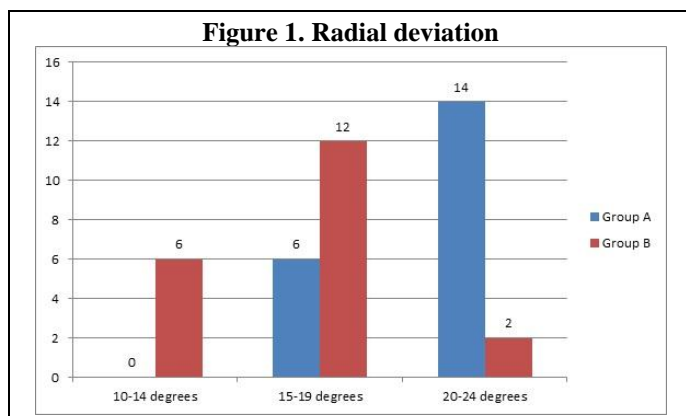
Complications were in the point range 0 to 5 depending of the severity of arthritic change and association of pain. Arthritic change minimum 1, minimum with pain 3, moderate 2, moderate with pain 4, severe 3, severe with pain 5. Nerve complications (median) given 1 to 3 and poor finger function due to cast 1 to 2. End result point ranges from 0 to 2- excellent, 3 to 8- good, 9 to 20- fair and 21 and above- poor complications like infection, residual pain, restriction of movements, pin site loosening, breakage of pins were noted.

**Observations**

The average dorsiflexion in normal wrist was 70°. The average dorsiflexion was 62.65° in group A and 58.6° in group B. 13 patients (65%) in group A showed dorsiflexion between 61-80° as compared to 8 patients (40% ) in group B. The average palmar flexion in normal wrist was 78°. The average palmar flexion in group A was 67.8° and group B was 61.5°. 15 patients (80%) of group A had palmar flexion between 61-80° as compared to 11 patients (55%) in group B. The average supination in

normal wrist was 88°. The average supination in group A was 72.3° and in group B was 63.8°. 19 patients (95%) of group A were having supination between 61-90° as compared to 14 patients (70%) in group B having the same range of supination. The average pronation in normal wrist was 88°. The average pronation in group A was 74.8° and in group B was 67.2°. 17 patients (85%) of group A had pronation between 71-90° as compared to 8 patients (40%) of group B. The average radial deviation was 22° in normal wrist. The average radial deviation in group A was 20.2° and in group B was 16.2°. Most of the 14 patients (70%) of group A were having radial deviation between 20-24° as compared to group B where 2 patients (10%) had radial deviation in the same range. The average ulnar deviation was 33° in normal wrist. The average ulnar deviation in group A was 30.1° and in group B was 26.4°. 14 patients (70%) of group A had ulnar deviation between 30-39° as compared to 6 patients (30%) of group B. According to

Dermit System of Sarmento et al<sup>4</sup> 60 % among external fixator group showed excellent results, 35% showed good, 5% fair result and none showed poor result, while in conservative group 15 % showed excellent, 55% good, 20% fair and 10% showed poor results. These observations clearly showed that group A having 95% excellent and good results and group B having 70% excellent and good results. Restriction of finger movements was observed in 2 patients (10%) in external fixator group and in 5 patients (25%) of conservative group. 1 patient (5%) in group A and 5 patients (25%) showed residual pain. None of the patient in conservative group presented with superficial pin site infection while the complication was seen in 2 patients (10%) of external fixator group. Restriction of movement was noticed in 1 patient (5%) of group A and in 5 patients (25%) of group B. 1 patient (5%) presented with pin site loosening in group A while no patient had pin site loosening in group B.



**Table 1. The average loss of movements**

Movements	Group A	Group B
Dorsiflexion	10.5%	16.3%
Palmar flexion	13.1%	21.2%
Pronation	14.98%	23.64%
Supination	17.79%	27.45%
Radial deviation	7.96%	26.36%
Ulnar deviation	8.64%	19.85%

**Table 2. Table of Supination**

Range (Degrees)	Group A	Group B
<50	0	2
51-60	1	4
61-70	9	12
71-80	9	2
81-90	1	0
Total	20	20

**DISCUSSION**

Functional end results were far superior in external fixator group than to conservative group. Conservative group had more average loss of dorsiflexion,

palmar flexion, radial deviation, ulnar deviation and supination/pronation as compared to external fixator group (table I, figure 1,2).

The most significantly altered movement was found to be supination (table I). Based on Sarmento et al [4] (1980) functional results in group A were excellent and good in 95% and fair in 5%, where in conservative group results were excellent and good in 70%, fair in 20% and 10% showed poor functional end results. Our results were comparable to literature by Clyburn [5] (1987) 94% good and excellent results. Cooney et al [6] (1979) reported 87% excellent and good results using external fixator. Heather Prince treated 16 patients with severe comminuted displaced fractures of radius and ulna with small AO fixator found 80% good or excellent functional results [7].

Bishay used AO mini external fixator in comminuted intra articular fractures of distal radius and reported 78.5% excellent score with 21.15% good score with all patients had normal wrist morphology [8]. Cooney analysed different external fixators in the treatment of unstable distal radial fractures. Overall, the number of good to excellent result, range of motion and incidence of complications were similar to each group [6]. Anand A, Sood LK observed excellent and good functional results were seen in 75% of the cases [9]. Complications like residual pain, restriction of finger movements, residual

deformity, prominent ulnar styloid were more common in conservative group as compared to external fixator group. There were few complications as could be attributed to any surgical procedure like superficial infection at pin site in 2 patients and breakage of schanz screw in one patient.

#### CONCLUSION

The external fixator has been proven to be simple, effective and reliable modality for treatment of distal radius fracture and maintenance of reduction. Owing to the mobility of wrist joint and uniqueness of articulation between carpal, radius and ulna good functional outcome is assured.

The complication profile of external fixator group was more favourable than conservative group with incidence of residual pain, restriction of finger movements, residual deformity and prominent ulnar styloid being more in conservative group.

**ACKNOWLEDGEMENT:** None

#### CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

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