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Comparative study between closed reduction and cast application with and without percutaneous K-wire fixation for extra articular fracture distal end radius

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Abstract

Introduction: The fracture of distal end of radius was before known for being common in old with low functional demand who sustained a low energy trauma. But the rate of this fracture has increased due to more number of old populations along with increasing number of road traffic accidents and other high energy traumas in all age groups who end up suffering this fracture^[1]. This joined with ever increasing demand for perfect reduction and a decreased difficulty in treatment of this fracture among the patients has brought greater importance to the way these fractures are managed

Method: This randomized comparative study was performed at Department of Orthopaedics, ERA'S Lucknow Medical College & Hospital, Lucknow for a duration of eighteen months on patients who were admitted after physical examination and X-ray of wrist, radio-logically confirmed extra-articular fractures of distal radius after fulfilling the inclusion and exclusion criteria's.

Results: Statistically at the end of 6 months there was no difference in the functional outcome.

Conclusions: Closed reduction and cast application and closed reduction with percutaneous k-wire fixation both treatment can be done as there is no superiority of one treatment over the other

Keywords: Extra articular, percutaneous, distal end radius

Introduction

Fracture of the distal end radius is one the most common injuries treated by the orthopaedic doctors. Nearly 18% of all fractures treated by orthopaedic doctors make up distal end radius injuries. It was first described by Pouteau in 1783 and later Abraham Colles in 1814. During Greek time the management of distal radius fracture included moving around of broken and separated arm until it is straight, then applying splints, which were subsequently hardened with grease and honey to maintain their position^[2]. Restoration of the radial length, radial tilt and ulnar variance are important for good functional results. To achieve the near anatomical reduction of distal radius the surgical fixation have an increasing demand and better implants for distal end radius are being developed. Lambotte in 1908, described use of percutaneously placed wire through the radial styloid to maintain reduction.

Material and methods

Study population: Normal adult patients of either sex who were admitted at Department of Orthopaedics, ERA'S Lucknow Medical College & Hospital with extra-articular fractures of distal radius.

Study design: Comparative Prospective study

Study location: Department of Orthopaedics, ERA'S Lucknow Medical College & Hospital, Lucknow, India.

Study Duration: 18 Months

Sample Size: 80 patients

Sample size calculation: The sample size is calculated on the basis of proportion of excellent results in the two groups using the formula^[3].

$$n = (\alpha + \beta) \cdot 2 \cdot \{1 - p_1 + 1 - p_2\} / p_1 \cdot p_2 \cdot \{n(1 - e)^2\}$$

Where $p_1 = 0.43$, the proportion of excellent result in group I
 $p_2 = 0.37$, the proportion of excellent result in group II
 Error ratio $e = 0.5$ considered to be clinically significant.

Type I Error $\alpha = 5\%$

Type II error $\beta = 20\%$ for detecting results with 80% power of study.

Data loss - 10%

The sample size comes out to be $n = 40$ each group.

Inclusion criteria

1. Presenting with injuries less than 2 weeks.
2. All patients who were radio-logically confirmed extra-articular fractures of distal radius (AO Types 23-A2, 23-A3).
3. Medically fit, willing for the procedure and given consent

Exclusion criteria

1. Patients with intra-articular fractures involving radio-carpal joint
2. Open fractures of distal radius.
3. Distal radius fracture associated with neurovascular deficit.

Patients found to be at anaesthetic risk were excluded

Results

In the present study, 80 patients with extra-articular fractures of distal radius were studied. They were randomly managed by closed reduction or K-wire fixation. In closed group 40 patients and in K-wire fixation 40 patients were included.

It was observed that majority 18 (22.5%) of patients were in 21 – 30 years of age followed by 16 (20.0%) 51 – 60 years and only 1 (1.2%) patient was more than 60 years. In closed group majority 11 (27.5%) patients in 51 – 60 years and in K wire group 11 (27.5%) patients in 11 – 20 years of age group. The variation of patients in different age range for both groups was found to be statistically significant ($p < 0.05$) and total mean age of both groups was also found to be statistically significant ($p < 0.05$).

Table 1: Distribution of mean values of Findings of 1st follow up

Findings of 1 st follow up (At 2 nd week)		Closed (n=40) Mean±SD	K-Wire (n=40) Mean±SD	P value
Radial inclination degree		21.58±1.44	21.63±1.63	0.885
Radial height (millimeter)		11.04±2.34	11.90±0.60	0.027
Volar tilt degree		19.90±4.22	20.60±3.26	0.409
Mean range movement	Palmar flexion degree	64.33±13.67	62.65±13.44	0.582
	Dorsi flexion degree	63.75±3.16	63.85±2.88	0.883
	Supination degree	72.43±4.92	72.25±4.63	0.870
	Pronation degree	75.95±5.76	74.08±6.82	0.188
	Ulnar deviation degree	24.13±3.11	24.23±3.74	0.897
Radial deviation degree		16.60±2.71	17.48±1.15	0.066

(*t' test significant $P < 0.005$; Non-significant $P > 0.005$)

Table 2: Distribution of Gartland and Werley demerit score (after six months) for all patients

Gartland and Werley demerit score (after six months)	Closed n=40 (%)	K-Wire n=40 (%)	Total n=80 (%)	P value
Subjective evaluation (0/2/4/6)	1.90±1.80	2.10±1.86	2.0±1.83	0.628
Objective evaluation (0/1/2/3/4/5)	0.85±1.33	0.73±1.26	0.79±1.29	0.667
Residual deformity (0/1/2/3)	0.58±0.78	0.63±0.84	0.60±0.80	0.783
Complications (0/1/2/3/4/5)	0.10±0.30	0.05±0.22	0.08±0.27	0.402
Nerve complications (median) (1/2/3)	1.0±0.0	1.0±0.0	1.0±0.0	-
Poor finger function due to cast (1/2)	1.0±0.0	1.0±0.0	1.0±0.0	-

(*t' test significant $P < 0.005$; Non-significant $P > 0.005$)

Discussion

Radiological parameters of wrist and mean range of movement was recorded at third follow up (at 6th week) and compared of both groups and all were found to be statistically non-significant ($p > 0.05$) except radial height ($p < 0.05$)^[4].

Conclusion

- Statistically at the end of 6 month there were no difference in functional status between close reduction and cast application and K-wire.
- Final outcomes in both group was found to be statistically non-significant ($p < 0.05$).
- Cost of the K-wire was significantly less in comparison to close reduction and cast application.
- 67% of patients had fracture in their left hand and only 26% patients in right hand.
- 42.5% patients had direct injury and 42.5% patients had fall

on outstretch hand.

- Percutaneous K wire is an effective means of treatment of extra articular distal radius fracture with early to immediate range of motion of the wrist, resulting in a fast early and comfortable functional recovery with anatomical alignment and bone healing.
- Majority 71.2% were males whereas 28.8% were females.

Mean BMI of all patients was 20.64 ± 3.60 and statistically difference between both group was non-significant ($p > 0.05$)

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