

Comparative evaluation of closed reduction versus Percutaneous Pinning and immobilization for the treatment of Non-Comminuted Extra-Articular Distal Radial fractures

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Abstract

Background: Distal radius fractures are one of the common injuries for which orthopedic consultations are sought. High energy trauma as seen in road traffic accidents is common cause of these injuries. Noncomminuted extra-articular fractures of distal radius are common in adult males following vehicular accidents. **Aim:** To study the outcome of patients having Non-Comminuted Extra-Articular Distal Radial fractures treated by closed reduction and Percutaneous Pinning and immobilization. **Methods:** This was a prospective cohort study conducted in the department of orthopedics. 40 adult patients with Non- comminuted extraarticular fractures of distal radius were included in this study on the basis of a predefined inclusion and exclusion criteria. All patients were treated by closed reduction followed by percutaneous pinning using K-wires. Below elbow plaster cast was given for 3 weeks after which plaster was removed and physiotherapy was started. Follow up X-rays were taken at 3 and 6 weeks. Functional outcome was assessed by Quick DASH scores. SSPE 16.0 was used for statistical analysis and p value less than 0.05 was taken as statistically significant. **Results:** Out of the 40 studied cases there were 34 (85%) males and 6 (15%) females a M:F ratio of 1:0.17. The most common affected age group was found to be <30 years (55%) and most common mechanism of injury was motor vehicular accidents (65%). All patients were treated by closed reduction followed by percutaneous pinning using K-wires. Excellent or good functional outcome was seen in 34 (85%) patients. 4 (10%) patients were found to have fair functional outcome and remaining 2 (5%) patients were found to have poor functional outcome as assessed by Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. **Conclusion:** Percutaneous pinning followed by immobilization of the fracture is an effective treatment for Non-comminuted extra-articular fractures of distal radius having excellent functional outcome.

Keywords: Distal Radial Fractures, Percutaneous Pinning, DASH, Functional Outcome.

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Introduction

Rapid motorization of society has increased the incidence of motor vehicular accidents and its consequences and distal radial fractures are common injuries seen following road traffic accidents.[1] The other causes of this type of fracture may include falling from height and similar instances of high energy impact. In all cases of distal radial fractures, the possibility of a pathological fracture should always be ruled out particularly in patients in whom the history doesn't suggest adequate trauma.[2] The common causes of such pathological fractures may be bone cyst, osteoporosis or hyperparathyroidism amongst others. These fractures are usually seen in young patients (< 30 years) since they are more likely to be involved in motor vehicular accidents and sports activities resulting in high velocity impact or fall on outstretched hands.[3] They are also common in elder patients (Above 60 years of age) and in these cases it is the weakness of bone rather than the intensity of trauma which is the primary cause of fracture in these patients.[4] The patients with distal radial fractures usually present with pain,

swelling and reduced movements around wrist joint after high velocity trauma or following from height. The diagnosis of distal radial fractures can usually be done on the basis of AP and lateral X-Rays of wrist and forearm. In complex cases cross sectional imaging such as computed tomography may be needed to accurately assess the distal radial fractures.[5] One of the most important steps of treatment of these fractures include accurate reduction. For accurate reduction these fractures had been commonly treated by closed reduction and internal fixation by K-Wires.[6] One of the common complications of these fractures include malunion and suboptimal functional outcome. In majority of these cases it is often difficult to achieve preinjury functional levels.[7] Range of motion at wrist and forceful handgrip are commonly affected following distal radial fractures. External fixators can also be used but rarely used due to high complication rates such as pin loosening, infections and delayed union and sympathetic dystrophy.[8] Poor functional outcome and complications such as malunion has made many researchers to look for alternative methods of managing these patients. An attractive alternative for managing these cases consist of Percutaneous pinning followed by immobilization of the fracture for 3 weeks.[9] This method is simple and affordable and reported to be having excellent functional outcome. Percutaneous pinning and immobilization were first described by Green DP who used percutaneous pinning in the treatment of 75 patients with comminuted distal radial fractures.[10] The author inserted pins through the metacarpals and proximal ulna and reduction was done.

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The pins were incorporated in a cast from elbow to knuckles. This pinning allowed movement of the fingers and the elbow in the affected cases. The authors found 86 patients treated by pinning and immobilization had good or excellent results. With this background we conducted this prospective study to study the outcome of patients having Non-Comminuted Extra-Articular Distal Radial fractures treated by closed reduction and Percutaneous Pinning and immobilization.

Materials and Methods

This prospective, comparative, descriptive, study was conducted at Department of Orthopedics, at Patna Medical College and Hospital, Patna, Bihar. The study was approved by the institutional research and ethical committee. The study was conducted between July 2017 and April 2018. An informed and written consent was taken from the participating subjects prior to the commencement of the study.

40 patients with Non-Comminuted Extra-Articular Distal Radial Fractures were included on the basis of a predefined inclusion and exclusion criteria. A detailed history was taken and demographic details were noted. Clinical examination was done. Anteroposterior and lateral X-rays were done in all the cases. Complete blood count, ECG, LFT, KFT and electrolytes and preanesthetic evaluation was done in all the cases. All the patients were posted for closed reduction under general anesthesia after taking informed and written consent.

Inclusion Criteria:Patients with Non-Comminuted Extra-Articular Distal Radial Fractures treated by percutaneous pinning and immobilization. Those who gave informed consent to be part of study.

Exclusion criteria:

- Those who refused consent.
- Patients with pathological fractures.
- Multiple fractures.
- Hemodynamically unstable patients.
- Patients presenting after 10 days of injury.
- Patients lost to follow up.

Patients having muscular dystrophies, rheumatoid arthritis or any autoimmune disease affecting joints.

Operative procedure

In all patients closed reduction was done under general anesthesia by traction and direct pressure over the displaced fragment. After successful reduction 2.0 mm K-Wire was inserted through the distal radial fragment across the fracture and reaching into proximal part of the distal radius. Second K wire was passed through dorsolateral aspect of proximal radial fragment across the fracture and reaching in to the proximal portion of distal radius. The wires were drilled so as to reach up to the opposite cortex. The K wires were left just outside the skin so as to be able to remove them at appropriate time. After this the affected hand was immobilized in below elbow plaster with wrist in neutral position. The satisfactory reduction was confirmed by AP and Lateral Radiographs.

The plaster was removed after 3 weeks. Physiotherapy and exercises were started after removal of immobilization cast. Repeat AP and Lateral radiographs were taken 3 weeks after removal of plaster cast K-Wires were Removed. Physiotherapy was continued for further 4-6 weeks. Functional outcome was assessed by Quick- Disabilities of Arm, Shoulder and Hand (Quick- DASH) scores.[11] SSPE 16.0 was used for statistical analysis and p value less than 0.05 was taken as statistically significant.

Results

This was a prospective study in which 40 patients with Non-Comminuted Extra-Articular Distal Radial Fractures and treated by closed reduction and percutaneous pinning using K-wires were included. Out of 40 studied cases there were 34 (85%) males and 6 (15%) females a M:F ratio of 1:0.17. Out of the 40 studied cases dominant hand was involved in 27 (67.50%) whereas non-dominant hand was involved in remaining 13 (32.50%) cases. The analysis of the age groups of the affected cases showed that the most common affected age group was found to be between < 30 years (55%) followed by 41-50 years (22.50%) and 31-40 years (17.50%).

Table 1: Age groups of the studied cases

Age group	Studied cases	
	No of patients	Percentage
< 30 yrs	22	55.00%
31-40 years	7	17.50%
41-50 years	9	22.50%
>50 years	2	5.00%
Total	40	100.00%

Mechanism of injury in majority of the patients with Extra-Articular Distal Radial Fractures was found to be motor vehicular accidents (65%), followed by fall on outstretched hand (25%) and sports injury (10%).

Mean radial height and volar tilt in immediate postoperative period showed that it was 10.88 +/- 1.92 and 7.72 +/- 1.34 respectively. At 12 weeks follow up Mean radial height and volar tilt was 10.92 +/- 2.12 and 8.12 +/- 2.32 respectively. The difference was found to be statistically significant.

Table 2: Mean radial height and volar tilt in studied cases

	Immediate Post-Op	At 12 wks Follow up	
Mean Radial Height	10.88 +/- 1.92	7.72 +/- 1.34	P= <0.0001 (Significant)
Mean Volar Tilt	10.92 +/- 2.12	8.12 +/- 2.32	P= <0.0001 (Significant)

All patients underwent closed reduction and Percutaneous Pinning followed by immobilization in plaster cast for 6 weeks. Patients were followed up for 12 weeks. The analysis of Quick-DASH which takes into account the maneuvers like opening jar, incidence of pain, intensity of tingling, quality of sleep, ability to socialize, heavy chores, ability to carry a bag, using a knife and limitation in routine work. From quick DASH scores it was found that 80% of the patients of non-comminuted extra-articular distal radial fractures treated by closed reduction and percutaneous pinning using K-wires were having no or mild functional difficulty whereas 5 (12.5%) and 2 (5%)

patients had moderate to severe difficulty. Only 1 (2.5%) patient had quick DASH score of more than 75 (unable). Analysis of the complications in the studied cases revealed that out of 40 operated cases there were 3 cases with postoperative complications. These complications included wound infection (2.5%), hematoma (2.5%) and nerve injury (2.5%) patients). All 3 patients with these complications were managed conservatively.

Discussion

This was a prospective study in which 40 patients with Non-Comminuted Extra-Articular Distal Radial Fractures who were

treated by closed reduction and percutaneous pinning using K-wires were included. There was a male preponderance in studied cases with M:F ratio being 1: 0.17. Kwan K et al conducted a study to determine the results of operative treatment of distal radial fractures with a 2.4-mm locking plate system. Seventy-five patients were recruited into the study out of which there were 41 males and 34 females, with a mean age of 51.[12] Many other studies such as by Gogna P et al.[13] and Myderrizi et al.[14] have also reported that the fracture of lower end of radius is more common in males as compared to females. This male preponderance may be due to more common involvement of men in road traffic accidents and sports injury. In our study the most common affected age group was found to be between < 30 years (55%) followed by 41-50 years (22.50%) and 31-40 years (17.50%). Forward DP et al reviewed 106 adults who had sustained a fracture of the distal radius over a period of 8 years and who were below the age of 40 years at the time of injury. The authors carried out a clinical and radiological assessment at a mean follow-up of 38 years (33 to 42). These were 74 males and 32 females, whose mean age at injury was 25 years (16 to 40). The mean age of affected case in the study conducted by Forward et al was similar to mean age of our patients.[15] Some other authors such as Beumer A et al,[16] and Egol KA et al,[17] have reported that these fractures are seen more frequently in a slightly older age group. All patients underwent closed reduction and Percutaneous Pinning followed by immobilization in plaster cast for 6 weeks. Patients were followed up for 12 weeks. The functional outcome of the patients was assessed by quick-DASH score. 80% of the patients of non-comminuted extra-articular distal radial fractures treated by closed reduction and percutaneous pinning using K-wires were having no or mild functional difficulty whereas 5 (12.5%) and 2 (5%) patients had moderate to severe difficulty. Only 1 (2.5%) patient had quick DASH score of more than 75 (unable). Das AK et al conducted a prospective study of 32 patients aged between 18 and 70 years with extra-articular distal radius fracture.[18] Patients were treated with closed reduction and percutaneous pinning using two or three K-wires. Excellent to good results were seen in 93.75% of the cases while 6.25% had fair results. In our study the analysis of complications in studied cases showed that out of 40 operated cases there were 3 cases with postoperative complications. These complications included wound infection (2.5%), hematoma (2.5%) and nerve injury (2.5% patients). A comparatively higher number of complications were reported by Das AK who reported that complications observed were pin loosening (n=13), pin tract infection (n=2), malunion (n=2), wrist joint stiffness (n=2), reduced grip strength (n=2) and injury to the superficial radial nerve (n=1). Similar outcome and comparable complication rates were reported by the author such as Rosati M et al and Gofton W et al[19,20].

Conclusion

Non-comminuted extra-articular fractures can be effectively treated by percutaneous pinning followed by immobilization of the fracture. Patients treated by percutaneous pinning were found to have excellent functional outcome with minimal complications.

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