

**ORIGINAL RESEARCH****Percutaneous pinning for non-comminuted extraarticular fractures of distal radius****<sup>1</sup>Dr Karan Alawadhi, <sup>2</sup>Dr Virender Singh Kadyan**<sup>1</sup>Senior Consultant, <sup>2</sup>HOD, Department of Orthopaedics, Malik Hospital Hansi, Haryana, India**Correspondence:**

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**Abstract**

**Background:** 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. The present study was conducted to assess the outcome of percutaneous pinning for non-comminuted extraarticular fractures of distal radius.

**Material & methods:** The present study was conducted among 50 patients with extra-articular distal radius fractures who were prospectively enrolled for the study. The patients underwent closed manipulation and percutaneous pinning with crossed K-wires as the primary procedure. Radiographic measurements of the postoperative dorsal angle and the ulnar variance were recorded/ and compared with the radiographs taken at the final assessment at six months.

**Results:** The mean pre-reduction dorsal angulation and ulnar variance were 21.98 degrees and 3.67mm, respectively. After surgery, the mean dorsal angulation and ulnar variance were -6.23degrees and 1.12 mm, respectively. At six months follow-up, dorsal angulation was -5.64 degrees and the ulnar variance was 1.54 mm. Pin loosening was encountered in 10% cases. Pin tract infection, malunion, Joint stiffness, reduced grip strength occurred in 4% respectively, were the other complications observed.

**Conclusion:** The present study concluded that percutaneous pinning for non-comminuted extraarticular fractures of distal radius allows early post-surgical wrist motion and has good radiological outcome.

**Keywords:** percutaneous pinning, non-comminuted, extraarticular fractures, distal radius.

**Introduction**

Fractures of the distal radius represent one-sixth of all fractures treated in emergency department.<sup>1</sup> The injury commonly affects postmenopausal osteoporotic women.<sup>2</sup> Initially, it was thought to be a simple fracture, but now, it is recognized as a complex injury because of its different fracture patterns and various treatment methods.<sup>3</sup> They account for 17.5% of all the fractures and 75% of forearm fractures.<sup>4</sup> The age distribution for distal radius fractures is typically in elderly females; with a male to female ratio of 1:4.<sup>5</sup> 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.<sup>6</sup> Various options of treatment have emerged over the years and these include closed reduction and casting, external fixation, percutaneous pinning and open reduction and internal fixation with plating.<sup>6</sup> Closed reduction and cast immobilization has

been the mainstay of treatment of these fractures, but invariably it results in malunion, poor functional and cosmetic outcome.<sup>7</sup> The primary goal of treatment of these fractures is restoration of wrist function.<sup>5</sup> Percutaneous K-wire fixation provides additional stability and is one of the earliest forms of internal fixation.<sup>8,9</sup> The present study was conducted to assess the functional outcome of percutaneous pinning for non-comminuted extraarticular fractures of distal radius.

### Material & methods

The present study was conducted among 50 patients with extra-articular distal radius fractures who were prospectively enrolled for the study. Before the commencement of the study ethical clearance was taken from the Ethical Committee of the institute and written informed consent was taken from the patient. The patients underwent closed manipulation and percutaneous pinning with crossed K-wires as the primary procedure. The mode of trauma was a simple fall on the outstretched hand in 30 patients and a sports-related injury in 20 patients. All were closed fractures. Fractures were classified according to the AO classification, using the preoperative anteroposterior and lateral x rays. Fracture displacement was characterized as displaced when there was dorsal angulation of  $> 10^\circ$  and positive ulnar variance of  $> 3$  mm. An acceptable reduction following closed reduction was a fracture with dorsal angulation of  $\leq 0^\circ$  and an ulnar variance of  $\leq 3$  mm. Radiographic measurements were made using a goniometer.<sup>11</sup> All procedures were carried out in the operation theater under general anesthesia or regional anesthesia. To allow easier access for the C-arm of the image intensifier, a hand table was used to support the limb. Closed reduction of the fracture was achieved by longitudinal traction and direct pressure over the displaced fragment under anesthesia. Reduction was checked under image intensifier in both anteroposterior and lateral planes. As an assistant held the wrist with fracture in the reduced position, scrutiny towards the apposition and alignment of the volar surface of the fracture was one key feature in assessing the reduction. Once the length and the dorsal angle of the radius were restored, the fracture was fixed by two crossed 1.8 mm smooth K-wires, inserted percutaneously with a power drill. If required, a third K-wire was passed from dorsolateral aspect from distal to proximal fragment. The wires were drilled to engage the opposite cortex. K-wires were bent at a right angle and cut short outside the skin for easy removal. The stability was finally evaluated by performing flexion and extension of the wrist under fluoroscopy. A sterile dressing including sponge padding was applied to prevent skin irritation. With the wrist in the neutral position, a dorsoradial below elbow plaster of Paris slab was applied up to the knuckles. Postoperative radiographs are obtained in the anteroposterior and lateral planes. Postoperatively, the limb was kept elevated for 24 hours. Active finger, shoulder and elbow mobilization was started at the earliest. Patients were discharged 24 hours post surgery after ensuring good distal circulation of fingers. At 4 weeks follow-up, X-rays were taken, both in the anteroposterior and lateral planes to check the position of the fracture. The slab was removed and active finger, wrist exercises and forearm pronation and supination exercises were started. Handgrip was improved by using soft ball exercises. At 6 weeks, anteroposterior and lateral view radiographs were repeated. K-wires were then removed without anaesthesia. Wrist physiotherapy and handgrip exercises were continued for another 2 to 4 weeks. Radiographic measurements of the postoperative dorsal angle and the ulnar variance were recorded/ and compared with the radiographs taken at the final assessment at six months.

### Results

In the present study 50 patients with Type II fractures underwent closed manipulation and percutaneous pinning with crossed K-wires as the primary procedure. Among the 50 patients,

50% were males and 50% females. The mean pre-reduction dorsal angulation and ulnar variance were 21.98 degrees and 3.67mm, respectively. After surgery, the mean dorsal angulation and ulnar variance were -6.23degrees and 1.12 mm, respectively. At six months follow-up, dorsal angulation was -5.64 degrees and the ulnar variance was 1.54 mm. Pin loosening was encountered in 10% cases. Pin tract infection, malunion, Joint stiffness, reduced grip strength occurred in 4% respectively, were the other complications observed.

**Table 1: Variations in the Dorsal Angle and Ulnar Variance**

	<b>Mean±SD</b>
Pre-reduction dorsal angle	21.98±7.87
Pre-reduction ulnar variance	3.67±0.624
Postoperative dorsal angle	-6.23±1.24
Postoperative ulnar variance	1.12±0.56
Dorsal angle at 6 months	-5.64±2.69
Ulnar variance at 6 months	1.54±0.604

**Table 2: Complications**

<b>Complication</b>	<b>N(%)</b>
Pin loosening	5(10%)
Pin tract infection	2(4%)
Malunion	2(4%)
Joint stiffness	2(4%)
Reduced grip strength	2(4%)

## Discussion

Distal radius fracture is a common injury. Accurate reduction of the fracture is the first step in treatment. Many options are available to maintain this initial reduction. The most common being closed reduction and cast application, but this is often associated with failure and complications.<sup>8</sup>

Percutaneous pinning with K-wires was first recommended by Green as a simple and nonexpensive procedure.<sup>12</sup>

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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 in a single tertiary teaching hospital. Seventy-five patients were recruited into the study out of which there were 41 males and 34 females, with a mean age of 51.<sup>13</sup>

In a retrospective study conducted by Glickel et al, distal radius fractures with closed reduction and pinning out of 55 patients 33 patients injured their dominant hand and 22 in the non-dominant as compared to our study. Range of motion in their post-operative follow up showed wrist flexion 69, wrist extension 65, wrist radial deviation 22, wrist ulnar deviation 34, forearm pronation 82, forearm supination 81, with mild difference in flexion and supination as of normal limb which was not clinically significant and outcome was measured with DASH score recorded in their final follow-up with average score of 9.7 whereas in our study K wire group shows a DASH score of 19 at 6 months follow up.<sup>14</sup>

Das AK et al did a study to examine the functional outcome of percutaneous K-wiring of these extra-articular distal radius fractures with immobilization in neutral position of the

wrist. Excellent to good results were seen in 93.75% of the cases while 6.25% had fair results.<sup>15</sup>

### Conclusion

The present study concluded that percutaneous pinning for non-comminuted extraarticular fractures of distal radius allows early post-surgical wrist motion and has good radiological outcome.

### References

1. Bucholz RW, Heckman JD, Brown CM: Distal radius and ulna fractures. Rockwood and Green's Fractures in Adults Philadelphia: Lippincot Williams and Wilkins; 5th ed. 2006;1:910.
2. Wigderowitz CA, Rowley DI, Mole PA, Peterson CR, Abel EW: Bone mineral density of radius in patients with Colles fracture J Bone Joint Surg Br 2000;82(6):930-31.
3. M. Akhter, Baig Kashif Ahmed, S. Mujahid Humail: Closed Reduction And Percutaneous Kirschner Wire Fixation Of Displaced Colles Fracture In Adults. Pakistan journal of surgery 2008;24:31-7.
4. Diaz-Garcia RJ, Chung KC. The evolution of distal radius fracture management: a historical treatise. Hand Clin. 2012;28(2):105-11.
5. Bhavi SB, Kallanagoudar AS, Kaladagi D, Sanakal NB. Comparison of functional outcome of extra-articular distal radius fractures treated by volar locking plate versus percutaneous pinning in adults-a retrospective study. Int J Res Orthop2021;7:611-4.
6. SL, Chakkour I. Computed tomography's influence on the classifications and treatment of the distal radius fractures. Hand (N Y). 2015;10(4):663–669. doi:10.1007/s11552-015-9773-8
7. Abramo A, Kopylov P, Tagil M. Evaluation of a treatment protocol in distal radius fractures: a prospective study in 581 patients using DASH as outcome. Acta Orthop. 2008;79(3):376-85.
8. Gofton W, Liew A. Distal radius fractures: Nonoperative and percutaneous pinning treatment options. Orthop Clin North Am 2007;38:175-85.
9. Castaing J. Recent fractures of the inferior extremity of the radius in the adult. Rev ChirOrthop French 1964;50:582-696.
10. Mah ET, Atkinson RN. Percutaneous Kirschner wire stabilization following close reduction of Colles' fracture. J Hand Surg Br 1992;17:55-62.
11. Bucholz RW, Heckman JD, Brown CM. Rockwood and Green's Fractures in Adults. Vol. 1. Philadelphia: Lippincot Williams and Wilkins; 2006. p. 910.
12. Green DP. Pins and plaster treatment of comminuted fractures of distal end radius. J Bone Joint Surg Am 1975;57:304-10.
13. Kwan K, Lau TW, Leung F. Operative treatment of distal radial fractures with locking plate system-a prospective study. Int Orthop. 2011;35(3):389–394.
14. Glickel SZ, Catalano LW, Raia FJ, Barron OA, Grabow R, Chia B. Long-term outcomes of closed reduction and percutaneous pinning for the treatment of distal radius fractures. J Hand Surg Am. 2008;33(10):1700-5.
15. Das AK, Sundaram N, Prasad TG, Thanavelu SK. Percutaneous pinning for non-comminuted extraarticular fractures of distal radius. Indian J Orthop 2011;45:422-6.