

## Extra-articular distal radius non-comminuted fractures percutaneous pinning.

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**Abstract:** Fractures of the distal radius constitute about 15 % of all fractures treated in emergency department. 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. This study was conducted to examine the functional outcome of non comminuted extra-articular distal end radius fractures treated with closed reduction and percutaneous K-wire fixation with immobilization and early physiotherapy.

This is a prospective study of hundred consecutive patients with extra-articular distal radius fracture. Accurate reduction of the fracture is the first step in the treatment of distal radial fractures. Percutaneous pinning is a simple and inexpensive procedure. Various techniques of percutaneous pinning are available.

Percutaneous pinning and immobilization of the fracture with wrist immobilized for 3 weeks and early physiotherapy is a simple inexpensive procedure for extra-articular noncomminuted distal radius fractures. It provides anatomic fracture reduction and fixation and allows earlier rehabilitation without jeopardizing the fracture alignment.

**Keywords:** Extraarticular distal radius fracture, percutaneous pinning, early physiotherapy.

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### I. Introduction:

Fractures of the distal radius constitute about 15 % of all fractures treated in emergency department<sup>(1,2)</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>(3,4)</sup>. Restoration and maintenance of anatomy correlates well with function. It adversely affects wrist motion and hand function. In many cases there is weakness of handgrip and restriction of range of motion<sup>(5,6,7)</sup>.

Percutaneous K-wire fixation provides additional stability and is one of the earliest forms of internal fixation. Few authors describe ulno-radial pinning drilled at 45° angle, 4 cm proximal to ulnar styloid<sup>(5,6,7)</sup>. Others described double intrafocal pinning into the fracture surface. Bridging external fixators and ligamentotaxis indirectly reduce the fracture<sup>(7,8)</sup>.

This study was conducted to examine the functional outcome of non comminuted extra-articular distal end radius fractures treated with closed reduction and percutaneous K-wire fixation with immobilization and early physiotherapy. Functionally, 66 patients had excellent hand function; 28 patients had good results; 6 patients who had residual displacement and joint stiffness had a fair outcome.

### II. Materials And Methods:

Hundred consecutive patients with extra-articular distal radius fractures were prospectively enrolled for the study between January 2010 and March 2012. 62 patients were male and 38 were female. The mean age of patients was 41.4 years (range 18-70 years).

Only patients with non comminuted extra – articular distal radius fractures were included in the study. All patients with intra- articular distal radius fractures, comminuted distal end radius fractures, presenting later than 2 weeks of injury, patients in whom ulnar shaft was not intact, polytrauma patients, patients with open fractures and patients with open fractures were excluded. Fractures were classified according to the AO classification, using the preoperative anteroposterior and lateral roentgenogram.

### III. Operative Procedure:

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, the first K-wire of 1.5-2.0 mm was inserted from the dorsolateral aspect of the distal radius fragment across the fracture and into the proximal

fragment under image intensifier guidance. A second K-wire was passed from the dorsomedial aspect of the distal fragment across the fracture into the proximal fragment. After checking the stability of the fracture under image intensifier, 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. 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 3 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.

Results were evaluated clinically and radiologically at 6 months using Sarmiento's modification of Lindstrom criteria

#### **IV. Results:**

All fractures healed. Restoration of anatomy was excellent in 66 patients and 28 patients had a good anatomical outcome while 6 had fair results. Preoperative radiographic assessment showed that the average radial height was 3 mm (range 1–4 mm) and volar tilt was  $-14.5^{\circ}$  (range 8 to  $-18^{\circ}$ ). Assessment of postoperative radiographs revealed that the average radial height was 11.5 mm (range 8-14 mm) and volar tilt was  $12.4^{\circ}$  (range 8- $16^{\circ}$ ) on the immediate postoperative X-rays.

Functionally, 66 patients had excellent hand function; 28 patients had good results; 6 patients who had residual displacement and joint stiffness had a fair outcome.

Pin loosening was encountered in 12 cases. Pin tract infection (n=6), malunion in (n=8), joint stiffness (n=9), reduced grip strength (n=6) and paresthesia in the distribution of superficial radial nerve (n=4) were the other complications observed. Reflex sympathetic dystrophy was encountered in 3. Post-traumatic arthritis of wrist, subluxation of distal radio-ulnar joint and penetration of vessel were not seen.

#### **V. Discussion:**

Distal radius fracture is a common injury<sup>(1,9,10)</sup>. The importance of anatomic reduction has been demonstrated by clinical studies as well as by laboratory assessment of force and stress studies. In fractures with articular displacement greater than 2 mm, radial shortening greater than 5 mm or dorsal angulation greater than  $20^{\circ}$ , suboptimal results have been reported in previously published studies<sup>(11,12,13,14)</sup>.

Accurate reduction of the fracture is the first step in the treatment of distal radial fractures<sup>(15,16,17)</sup>. Many options are available to maintain this initial reduction. The most common traditional method is closed reduction and cast immobilization, but this often fails to prevent early radial collapse and is associated with a high risk of malunion, joint stiffness and painful wrist. Hence, this method is for low-demand elderly patients<sup>(18,19)</sup>.

External fixators can maintain radial length and radial inclination by ligamentotaxis, but cannot effectively maintain palmar tilt<sup>(20,21)</sup>. Also complication rates as high as 58% have been reported with the use of external fixators<sup>(22,26)</sup>. These mainly include pin loosening, pin tract infection, reflex sympathetic dystrophy, radial sensory neuritis and delayed union. Thus, external fixators are better avoided in noncomminuted extra-articular distal radial fractures.

Percutaneous pinning is a simple and inexpensive procedure. Various techniques of percutaneous pinning are available. Prolonged immobilization of the wrist for greater than 3 weeks increases the magnitude of the problem. Fracture reduction was achieved by longitudinal traction and direct pressure over the displaced fragment followed by percutaneous pinning. Active finger mobilization was started immediately.

Significant radial shortening was observed in 5 cases only. Radial shortening remains the main displacement in distal end radius fractures, especially intra-articular and comminuted fractures<sup>(23,24,25)</sup>. In our opinion, percutaneous pinning maintains radial length adequately in extra-articular distal radial fractures.

Six cases in our series had pin tract infection, but this was superficial and did not necessitate early removal of the pins. The infection subsided with removal of the pins at 6 weeks. Eight patients also had malunion with significant radial shortening<sup>(27,28,29,30)</sup>, wrist joint stiffness and reduced grip strength<sup>(29,30)</sup>. The functional result obtained in these patients at the end of follow-up period was fair.

Loosening of one of the K-wires was observed in 12 cases at the time of removal of the pins, but it did not jeopardize the fracture alignment. Circumferential cast for additional immobilization was not necessary.

## VI. Conclusion:

Percutaneous pinning and immobilization of the fracture with wrist immobilized for 3 weeks and early physiotherapy is a simple inexpensive procedure for extra-articular noncomminuted distal radius fractures. It provides anatomic fracture reduction and fixation and allows earlier rehabilitation without jeopardizing the fracture alignment.

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