

## A comparison of percutaneous and pin-and-plaster techniques in distal radius fracture

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### Abstract

**Background:** Distal Radial fracture is one of the most common fractures of the skeletal system. Although it has been believed to be a simple fracture with excellent outcomes, practical operations' results have always been undesirable and even poor. The goal of this study was to compare two methods of treatment "pin and plaster and pre-cautious pin fixation in patients with unstable extra-articular distal radial fracture.

**Methods:** This clinical-trial study was done in Emdadi Kamyab Hospital of Mashad University in the year 2006. 78 Patients were randomly divided into 2 groups. One group (38 patients) was treated using pin and plaster and the second group (40 patients) were treated with percutaneous pin fixation. History, physical examination and pre- and postoperative x-rays were taken from all patients. The mean follow-up time was 12 weeks. Data were collected by questionnaires and were analyzed by descriptive statistics and SPSS software and T-test.

**Results:** The mean age of the patients in both groups were approximately 53-years-old. There was no significant statistical differences according to sex between two groups. In pin-and -plaster group radial shortening was 2.9 mm, mean dorsal angulation was 22.18 degree, but in percutaneous pin (PCP) group the results were 4.05 mm, 23.43 degree respectively.

**Conclusion:** Range of motion of the wrist and elbow, rotation of the Forearm, reduction of the fracture all yielded better results in the PCP group.

**Keywords:** pin and plaster, percutaneous pin fixation, wrist fracture

### Introduction

Distal radial fractures are of the most common fractures among adults [1]. Studies revealed that 90% of the patients of this kind have some degrees of disability [2,3].

The indications of percutaneous pin fixation are: 1-unstable fractures that are reducible in

younger patients, 2-without significant shortening and volar comminution, 3-failed closed reduction due to dorsal angulation [4,5].

The indications of external fixator or pin and plaster traction cast are: 1-Failed closed reduction after two attempt, 2-in metaphysical comminution or osteopenia [6-8].

Green has reported 75 patients with commin-

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uted distal radial fractures that treated using pin and plaster technique [8].

In the commercially unavailable situations, pin and plaster traction cast is useful as an alternative technique and its indications is like external fixation.

In the process of selecting treatment plan, one must strike a balance among anatomic reduction, stable fixation, minimal soft tissue damage and early range of motion. One of the most common, easy and economic treatments is simple casting which is performed on cases with minimal displacement and stable fractures [9]. Percutaneous pin fixation technique is one of the treatment methods applied in unstable fractures [9].

This study aims at comparing the results and possible complications of the percutaneous pin fixation (PCP) and pin-and-plaster technique.

### Methods

This clinical trial study was carried out on patients with distal radial fractures who were admitted to the Orthopedic Ward of Emdadi Hospital in 2006. 78 patients with unstable extrarticular fracture of the distal radius were studied. All the patients were in A2 type according to AO classification system. In the current study, fractures with more than 20 degrees of dorsal angulation and more than 10 mm decrease in radial height were included. Exclusion criteria are: 1- a history of previous fracture or deformity in the wrist, 2- open fractures, 3-shear fractures, 4- intra-articular fractures, 5-delay more than seven days. In the current study, fractures with more than 20 degrees of dorsal angulation and more than 10 mm decrease in radial height were included (criteria of instability). We just extracted the fractured wrist for determining the degree of angulation and shortening.

The patients were randomly divided into two groups. The first group included 38 patients treated using pin and plaster technique, and the second group (40 patients) was treated using PCP.

In pin-and-plaster, after 3-5 minutes of axial traction, a 2.2mm pin was inserted in the base of second and third metacarpus and another pin was inserted 7-10cm distal to the olecranon from medial to lateral, and all performed under sterile conditions. Then, after the reduction, a long arm cast was applied which incorporated pins.

In PCP technique, after closed reduction, the fracture was stabilized using 2 pins.

For all patients physical and clinical examinations, AP and lateral x-rays were done. In the first x-rays radial angle and height were determined. Normal radial height is 12mm with a radial angle of 22 degrees [6].

The fingers motion was started immediately after operation, the limb was elevated and was constantly checked out in regard to compartment syndrome. Control x-rays were done in the first and second weeks after reduction. If there was any suspicious symptom of infection in the pin sites, a window in the cast was opened and the necessary treatments were done to treat infection.

In the fourth week after operation, on the patients treated using PCP, control x-rays were done and in case of good conditions, the long arm cast was replaced with a short one. X-ray follow-up was once more done in the sixth week. The casting period for both groups of the study according to their union condition ranged between 6-8 weeks and the pins of the both groups were removed after 6 weeks.

After removing the cast, the wrist, fingers and elbow motions started and 6 weeks later the patients were examined in regard to the range of motion of the wrist and elbow. During the follow-up, in case of reduction failure, another reduction was done. Acceptable reduction parameters included no more than 2 mm radial shortening, radial inclination at least 10 degrees and 11 at least neutral lateral tilt [12].

Personal information, the results of clinical and physical x-rays examinations, follow-up length and complications were all gathered

with the help of questionnaires. The collected data were analyzed using descriptive statistics, frequency distribution tables, SPSS software and T-test.

**Results**

The mean age of the first group (pin and plaster, 38 patients) was 51.5 with a SD of 16.2. As for the PCP group with 40 patients, the mean age was 54.9 with a SD of 16. According to the T-test carried out for mean age of the two groups, there was no significant difference between the two groups.

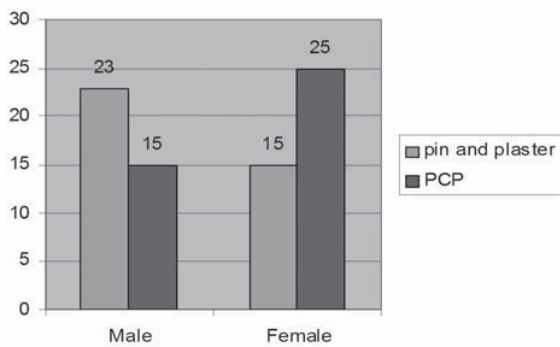


Fig. 1: The sex of patients across the two groups.

The gender of patients in both groups is displayed in table 1 and there was no significant statistical difference between the two groups (Fig. 1).

Radial shortening in the first group (pin and plaster) was 2.91 with a SD of 2.32 and in the second group (PCP) was 4.05 with a SD of 2.92. There was no significant statistical difference between the two groups regarding the height of radius decrease and hence there was no significant difference between the two groups regarding the extent of deformity on the basis of the

height of radius decrease.

The mean dorsal angulation in the pin and plaster group was 22.18 with a SD of 10.10 and in the PCP group was 23.43 with a SD of 8.89. There was no significant difference between the two groups regarding the severity of injury based on the angulation.

The mean ulnar tilt in the first group was 12.21 degrees with a SD of 5.06 degrees and in the second group (PCP) was 11 degrees with a SD of 4.46. Based on the T-test carried out there was a significant difference between two groups (P= 0.0463).

The patient satisfaction regarding the pin sites in the first group was 28.9% and in the second group it was 27.2, showing no significant difference. The mean pin site infection of the two groups under study is shown Table 1.

Regarding the reduction loss, there were 5 cases in the pin and plaster group (6.6%) and only one case in PCP group, indicating no significant difference (P=0/0768).

The mean of wrist flexion and extension in the first group was 94 degrees with a SD of 11.68 and for the PCP group was 107.56 degrees with a SD of 11.80. Here a significant difference between the groups was observed in favor of the PCP group.

The mean of forearm rotation in pin and plaster group was 86.52 degrees and a SD of 14.13 and in the second group was 95.85 degrees with a SD of 12.92. There was a significant difference between the groups where the second group showed a better result (P=0.0037). The mean of elbow flexion and extension in the first group was 104.44 degrees with a SD of 12.97 and in the PCP group it was 122.05 degrees with a SD of 15.59. There was a significant difference between the two groups (P=0.00001), with

	Without infection		With infection	
Pin and plaster	18	23.7 %	19	25 %
PCP	31	40.8 %	8	10.5 %
Sum	49	64.5 %	27	35.5 %

Table 1. The rate of pin site infection in the two groups.

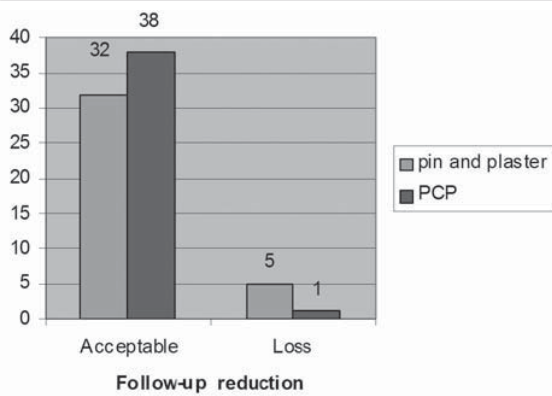


Fig. 2. The rate of reduction loss between two groups after distal radial fracture.

a better result in the PCP group.

### Discussion

The results of this study revealed that, in comparison to pin and plaster technique, PCP had better reduction and better range of motion of the wrist, forearm and elbow for the A2 type of the distal radial fractures.

The patients were randomly selected. The gender and age distributions in both groups were quite alike and there found no significant difference between the two groups. The fracture type in all cases was the same. Radial height in both groups was the same and there was significant difference ( $P=0.0688$ ) between the two groups. The degree of dorsal angulation before reduction was the same with no significant difference ( $P=0.5692$ ) between the two groups. The mean of ulnar tilt before reduction had no significant difference between the two groups ( $P=0.0463$ ).

The range of motion of the wrist was significantly better than the other group ( $P=0.0001$ ). Also, forearm rotation was significantly better than the other group ( $P=0.0037$ ). The range of motion of the elbow was significantly better ( $P=0.0001$ ). And finally, Pin site complication was significantly higher in the pin and plaster group ( $P=0.0102$ ).

The condition of reduction in the PCP group was better, however it was not significant. Loss of reduction in the PCP group was less, but it

wasn't significant.

Patient satisfaction was the same in both groups ( $P=0.7933$ ).

In a study carried out in the Utah Medical Centre on 90 fractures of distal radius, similar results were observed in the comparison of pin and plaster with external fixation technique [11,13]. In another study in Fapoz University of Madrid, best results were obtained in the PCP group [14]. In a study on 40 patients with unstable distal radial fractures, the PCP technique was compared to traditional casting where the PCP technique yielded better results. In another study in India on 50 patients a comparison was done between PCP and closed reduction and simple casting. The best result was that of the PCP group [15]. In a study in Norway on 60 patients of more than 20 years of age with unstable fractures, PCP proved to be cheaper, easier and more accessible technique[16].

According to what was discussed above, while statistically no significant difference between PCP and pin and plaster concerning loss of reduction and anatomic reduction was found. PCP yielded better results concerning the range of motion of the wrist and elbow, forearm rotation and pin site complication.

Although pin and plaster is regarded as a kind of external fixator, there is hardly any study that has dealt with its comparison with PCP.

Based on the findings of this study, where possible, due its advantages the application of PCP is preferred to pin and plaster in A2 type fractures of distal of the radius.

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