ORIGINAL ARTICLE

Outcome of closed reduction and plaster cast immobilization of fractur distal radius in adults

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Abstract

Objectives: To determine the outcome of closed reduction and plaster cast immobilization of fracture distal radius in adults in tertiary care hospital in Peshawar.

Methodology: This descriptive case-series, single center study was conducted in Department of Orthopaedic and Trauma, Khyber Teaching Hospital, Peshawar from April 2009 to April 2010. A total of 97 patients including both inpatient and outpatient were included in this study. Patients with unilateral extra-articular fractures were included in the study. All patients with open fractures and children with distal radial fractures were excluded from the study. After X-ray of the wrist, closed reduction of the fracture under local hematoma anesthesia block was done and below elbow plaster cast was applied for 6 weeks. Follow-up every 4th week till 30th week was done. Functional assessment of wrist flexion and extension with goniometer and grip strength of the hand with dynamometer was recorded in each visit.

Results: Normal wrist flexion, extension and grip strength of the hand was recorded for 86 (88.6%) of our patients. 11 patients (11.3%) 7 male and 4 female, however could not achieve both their normal wrist motion and grip strength at the end of our study. The younger age group (16-25 years and 26-35 years) regained their normal wrist mobility and grip strength earlier (at 14th to 18th week) than older age group (46-55 years and 56-65 years) who regained their full normal wrist motion and grip strength at 18 to 22nd week of follow-up.

Conclusion: Conservative treatment should be the first choice in extra-articular distal radius fractures.

Keywords: Closed reduction, cast immobilization, distal radius.

Introduction:

The incidence of distal radius fracture has increased substantially during the last fifty years.[1] Fractures of the distal radius are the most common of all orthopaedic injuries accounting for nearly 20% of all fractures presenting to emergency department in United Kingdom.[2] Such injuries account for approximately one-sixth of fractures treated in US emergency departments.[3] Physicians at a Japanese hospital found most distal radius fractures occurred in patients in their twenties (82.3 percent).[4] Both age and gender play a role in the risk of distal radius fracture. At 50 years of age, a white woman living in the United States or Northern Europe has approximately a 15 percent lifetime risk of a distal radius fracture; a man in the same regions has a lifetime risk of just over 2 percent.[5] Among elderly men, distal radius fracture appears to be an early and sensitive marker of skeletal fragility.[6,7] A fracture of the distal radius is considered to indicate an increased risk of future fractures, especially a hip fracture. The main causes may be osteoporosis or a tendency to fall, separately or in combination.[8] The reported complication rate of distal radius fractures in the literature varies from 6% to 80%. Complications may occur from the fracture or its treatment.[9] The most frequent complications are impairment of joint mobility and residual pain.[10]

There is no level-I clinical evidence suggesting

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Pak J Surg 2010; 26(4):315-319

a superior modality for the treatment of distal radial fracture.[11] Treatment options varies depending on injury severity and stability of the fracture reduction. Common surgeries include pinning with and without external fixation and open reduction and internal fixation. Technological advances such as locking and fixed angle plates have made the volar approach feasible. Dorsal plating with low profile plates and fragment-specific techniques can be successful in treating distal radius fractures. Closed reduction and immobilization can be used for stable fracture distal radius.[12]

A systematic review found insufficient evidence to determine which conservative treatments are most appropriate for common adult distal radius fractures.[13] Conservative methods involving manipulation followed by immobilization of forearm and wrist in dorsal slab is the most commonly involved method of treatment.[14] In long term, external fixation of distal radius fracture does not confer an improved outcome when compared to plaster immobilization.[15] Wrist mobility returned notably faster than grip strength of the hand and patients of over 60 years of age recovered slower in both mobility and strength of the hand when treated with closed reduction and plaster cast immobilization for fracture distal radius.[16] No significant difference in functional outcome in terms of pain, range of movements, grip strength and activity of daily living have been reported when plaster cast immobilization is compared with supplementary percutaneous pinning for fracture distal radius.[17]

The present study was conducted to determine the outcome of closed reduction and plaster cast immobilization of fracture distal radius in adults in tertiary care hospital in Peshawar.

Methodology:

We conducted a descriptive, case-series one center (Department of Orthopaedic and Trauma Khyber Teaching Hospital, Peshawar) study of 97 consecutive fracture distal radius patients, both inpatient and outpatient from April, 2009 to April, 2010. All consenting patients of both genders, 16 years of age and above with unilateral radial fracture and fracture belonging to Universal Classification Type-II (extra articular displaced/stable distal radial fracture) were included in the study. All patients with open fracture distal radius, additional fractures and injuries of the hand, wrist and forearm, children (below 16 yrs of age), and distal radial fractures more than three days old were excluded from the study.

All patients of distal radial fracture fulfilling the criteria were enrolled into the study on the day that their cast was applied. The rationale was explained in accordance with the principles laid down by Ethics Committee Khyber Teaching Hospital Peshawar and informed written consent was obtained. Relevant history and X-ray of the wrist joint was taken. All patients with extra-articular displaced/stable radius fractures were manipulated under local hematoma anesthesia block (1% Lignocane) and wrist and forearm was immobilized in below elbow plaster cast in neutral position, and the extremity was kept elevated in a sling for 6 weeks. In the out-patient review at 6th week, plaster cast was removed after check X-ray and range of movements of wrist flexion and extension was measured in degrees with the help of goniometer (Plastic Goniometer 8" No.T0054B).. Grip strength of the hand was measured in pounds with the help of Jamar Hydraulic hand dynamometer (Jamar® Type 0-200 lbs, Dimensions 8" × 11" No.5030 J1). The JAMAR® Hand Dynamometer was set to the second handle position from the inside (1.5 inch). The scores of three successive trials for the hand tested was recorded. The average score of the three trials was calculated in pounds. Follow up of all such patients were then carried out every month for the next 6 months and range of movements of the wrist and grip strength of the hand was recorded in the proforma in each visit.

The data was analyzed using SPSS version 11. The data was tabulated/ graphed. Mean, Mode, Median, Percentages, Frequencies and ratios were recorded where necessary. No statistical test was applied because the study design was descriptive.

Results:

The study was conducted in the Department of Orthopaedic and Trauma Khyber Teaching Hospital, Peshawar.

A total of 97 patients with extra-articular fracture distal radius were included in the study. Out of these 97 patients, 40 (41.2%) were male and 57 (58.7%) were female with male female ratio 1:1.4.

Age distribution, gender and frequencies of fractures are shown in Table 1. The incidence of distal radial fracture was highest (40.2%) in patients' age group 56-65 year.

The mean age was 52 years and the median age was 55 years with mode age 60 years. The minimum age was 16 years and maximum 85 years.

Eighty five (87.6%) patients had fracture distal radius on right side (in 81 patients the right hand was dominant) while 12(12.3%) patients had fracture of the left radius (4 patients were left hand dominant).

The mode of injury of fracture distal radius is shown in Fig. 1. Fall on outstretched hand was responsible for majority (73 patients or 75.2%) of fractures in our study.

Normal wrist flexion, extension and grip strength of the hand was recorded for 86(88.6%) of our patients. Wrist flexion and extension returned to normal faster than grip strength of the hand for the same age group of patients. The younger age group (16 to 25years and 26 to 35 years) regained their normal wrist mobility and grip strength earlier (at 14th to 18th week) than older age group (46 to 55 years and 56 to 65 years) who regained their full normal wrist motion and grip strength at 18 to 22nd week of follow up.

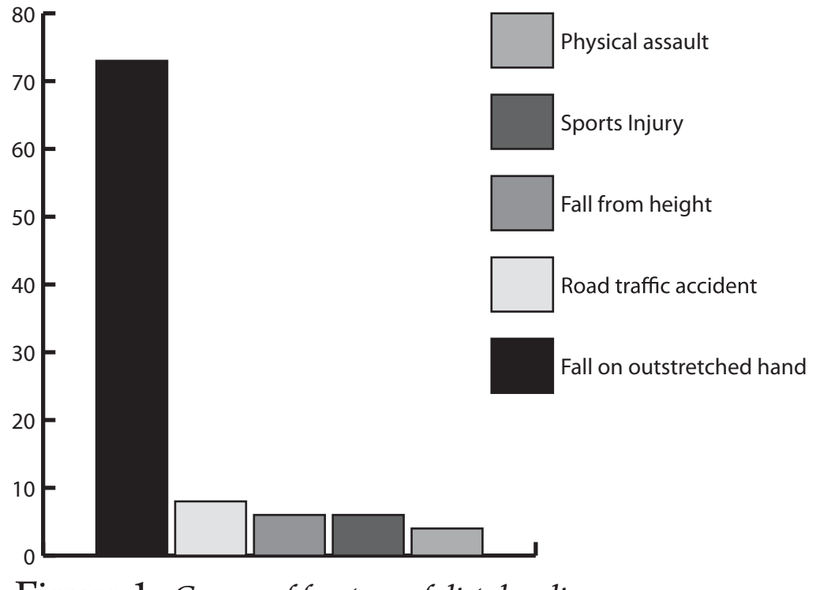

Figure 1: *Causes of fracture of distal radius*

Eleven patients (11.3%) 7 male and 4 female, however could not achieve both their normal wrist motion and grip strength at the end of our study.Six of these patients belonged to the age group 26-35 years.

Hand dominance and gender did not cause any difference in regaining of wrist mobility and grip strength in our study.

Discussion:

Distal radius fractures are a common injury, particularly in the elderly population. In terms of treatment, several options exist. Non-operative management consists of closed reduction and plaster cast immobilization.

Our first finding of the study was that the incidence of distal radius fracture appeared to be both gender and age specific. Out of 97 patients, 40 (41.2%) were male and 57 (58.7%) were female in our study and the incidence of distal radial fracture was highest (40.2%) in patients' age group 56-65 years. A local study also found a higher incidence of the distal radial fractures in females with female to male ratio 2:1, due to post menopausal osteoporosis.[18] This higher incidence of distal radius fractures in females is also reported by some other international studies. [19-21]

The mode of injury of fracture distal radius was fall on outstretched hand in majority (75.2%) of our patients. Mehboob and Anjum recorded fall

Table 1: *Age distribution, gender and percentages of our patients*

		Gender		
Age Group (Years)	**No. of Patients**	**Male**	**Female**	**Percentage**
16 – 25	8	6	2	8.2%
26 – 35	10	6	4	10.3%
36 – 45	9	5	4	9.2%
46 – 55	21	9	12	21.6%
56 – 65	39	10	29	40.2%
66 – 75	7	3	4	7.2%
76 – 85	3	1	2	3%

on the outstretched hand as a cause of fracture distal radius in 24 out of 30 (80%) of their patients.[18] A German study, in 2007 found that fall was responsible for 65.1 % of fractures.[21] There was also a difference in the mechanism of injury between the groups in our study. The majority of osteoporotic fractures occur as the result of a fall, while the majority of injuries in the younger patients are secondary to motor vehicle accidents and sports. Similar findings were recorded by Cuenca, Adams, and Miller in their studies.[22, 23, 24]

Normal wrist flexion, extension and grip strength of the hand was recorded for 86 (88.6%) of our patients in our study. Similar to our study, excellent or good functional results were obtained in 24 out of 54 patients in another international study. [19] Young and Rayan concluded that non-operative treatment of distal radius fractures yields satisfactory outcome, especially in those with low functional demands. It also is indicated in poor operative candidates.[25] Altissimi and Antenucci observed the long-term results of the conservative treatment of wrist fractures in a follow-up study of 297 cases over a period of one and one-half years to six years and recorded a decrease in grip strength in 17.8% of cases. A limitation of wrist movement was not frequent.[26] This study however, had a longer follow-up time than our study.

Rajan and Jain in a study conducted in India in 2008 concluded that functional results of extra-articular fractures of lower end radius are superior if the fractures after reduction are immobilized in dorsiflexion of wrist rather than in conventional palmar flexion position.[27] The reduction of fractures were done under image intensifier, the degree of wrist immobilization was either 15° PF or 15° DF, grip strength was measured as mm of Hg and the results were scored by Demerit Scoring System of Saito in this study.

During the 34th Brazilian Congress of Orthopedics and Traumatology, it was found that the classification method for fractures of the distal radius that was most used was Frykman (34%), followed by the Universal Classification(30%) and the AO/ASIF classification(26%) and the most frequent complications in conservative treatment were impairment of joint mobility (29%) and impairment of grip strength (12%).10 However, this study had sampling error 7%, power 80% ,confidence interval 95%,and sample size 439.

In our study we found that wrist flexion and extension returned to normal faster than grip strength of the hand for the same age group of patients. The younger age group (16 to 25years and 26 to 35 years) regained their normal wrist mobility and grip strength earlier (at 14th to 18th week) than older age group (46 to 55 years and 56 to 65 years) who regained their full normal wrist motion and grip strength at 18 to 22nd week of follow up. This aspect of our study resembles to some extent the study done by Foldhazy and Tornkvist who observed that recovery of grip strength was slower than that of range of motion. Elderly patients recovered more slowly than young patients and patients over 60 years of age recovered slower in both mobility and strength.[16] But their sample size (50 patients) was smaller than ours (97 patients).

In our study we found that hand dominance and gender did not cause any difference in regaining of wrist mobility and grip strength. Petersen concluded that the 10% difference in maximal voluntary isometric contraction of grip power between dominant and non-dominant hand was valid only for right–handed healthy individuals.[28]

In our study we did not routinely refer our patients to physiotherapy department for hand exercises after cast removal, rather we advised them home exercises. Wakefield and McQueen reported that home exercises are adequate rehabilitation after uncomplicated fracture of the distal radius, and routine referral for a course of physiotherapy should be discouraged.[29] However, one study showed that patients who attended physiotherapy achieved significantly greater increases in wrist extension and grip strength after 6 weeks compared to patients who received

no active therapy.[30] Maciel suggested that after removal of cast from fracture of distal radius, patients may routinely require no more than a single session of advice and exercise provided by a physiotherapist.[31]

Conclusion:

Fracture of the distal radius ('broken wrist' or Colle's fracture) is a common clinical problem. The evidence of the overall excellent functional results of the conservative treatment provided by our study, we recommend that conservative treatment should be the first choice for treating stable extra-articular fracture distal radius particularly in elderly patients.

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