

The Efficacy of Closed Reduction of Distal Radius Fractures in Emergency Department

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ABSTRACT

Background: Distal radius fracture is a common problem in emergency department. The aim of this study was to evaluate the efficacy of closed reduction of distal radius fractures in emergency department.

Method: This prospective, cross-sectional study was done in 2012 on patients between the ages of 18-50 years with distal radius fractures in emergency department of an educational Hospital in Tehran. closed reduction was done by emergency medicine specialist. Radiography was taken before and after the reduction, one, two and three weeks after reduction. DASH questionnaire was completed by patients after 6 weeks and six month of reduction. SPSS version 20 was used for data analysis. $P < 0.05$ was considered statistically significant.

Results: totally 96 patients participated in this study. 20.8% of them were women and 79.2% were men. The mean \pm SD of patients age was 30 ± 12 years. Significant difference was seen in radial inclination, radial height and palmer tilt before and after reduction in patients ($p < 0.01$). these values had been closed to the normal range after reduction. The median DASH scores were 34.1 and 7.5 after six weeks and six month of reduction respectively. no significant difference was seen in comparing DASH scores with the age, sex and radiographic parameters of the patients.

Conclusion: our findings showed that closed reduction method for distal radius fractures could be an effective, cheap and simple method in emergency department.

keywords: distal radius fractures, closed reduction, complications, DASH.

INTRODUCTION

The distal radius fractures are one of the most common injuries in the emergency department. Effective treatment for distal radius fractures has changed over the past two decades. These fractures totaled nearly 200 thousand fractures annually in the United States of America. Although a large percentage of these fractures occur in the elderly, but a large increase in prevalence is seen in all age groups (1). These fractures include one sixth of the total fractures in the emergency department (2). Regarding the treatment of this type of fracture, there are many differences. The usual methods of treating distal radial fractures include closed reduction and casting, open reduction, operation, external fixation and pin in plaster (3). On the other hand, treatment with surgery is followed by different complications as well (4). Non-surgical treatments such as closed reductions are methods that are associated with less aggression (5,6). Few studies regarding closed reduction of distal radial fractures have been performed (7-8). The aim of this study was to evaluate the clinical and functional outcomes of distal radius fractures by emergency medicine specialists.

METHOD

This prospective cross sectional study was conducted on patients aged 18 to 50 years in 2012 in emergency department of Shohada e 7 Tir Hospital, one the largest medical centers in Tehran. the research was performed on all patients participating in the study, up to six months after the time of reduction, from July 2012 to November 2012. All patients with distal radius fractures who were admitted in Tehran

emergency department of Shohada e 7 Tir hospital participated in this study. Patients who required surgery or their initial Reduction was not acceptable, also patients Ongoing radiotherapy or chemotherapy, patients with Metabolic disease affecting the bone, using Medication affecting the bone, having Dementia, psychiatric disorder, or alcohol abuse were excluded from the study. For our patients, deep sedation was performed with fentanyl drugs ($1\mu\text{g}/\text{kg}$) and thiopental sodium ($2\text{mg}/\text{kg}$) under cardiac monitoring and pulse oximetry and prescribing oxygen was done.

Radiographs of patients were performed at 5 stages of reduction as follow: after reduction, one, two and three weeks after reduction. The radiographic parameters in the standard views were as follow: Radial Height, Radial inclination and Palmer tilt. Patients at follow-up visits in the first and the second and third weeks had unacceptable movements based on radiographic findings, were taken operation. Functional outcome questionnaire (Disabilities of Arm, shoulder and Hand DASH), 6 weeks and 6 month after removing the cast was completed during the physical examination. DASH is a questionnaire presented by America's Orthopedic Association and it contains 30 subjects filled out by the patients and it reviews the complaints and physical performance of the patients who have faced with muscle and bone injuries (9). DASH outcome of patients with scores of 0 to 100 (excellent to poor) were identified in the questionnaire items. The data was analyzed by SPSS software version 20. Student's t-test was used for continuous data such as radiographic measurements. Spearman correlation coefficient was used to calculate correlations between DASH scores and radiographic parameters. $P < 0.05$ was considered statistically significant.

RESULTS

After the initial management, 96 patients had an acceptable reduction whereas 26 patients had an unacceptable reduction so that they taken operation. Totally 96 patients participated in the study, of 20 women (20.8) and 76 men (79.2 %). Mean \pm SD of the age of the patients studied was 30 ± 12 years. The mean and standard deviation of radial inclination, before and after reduction were respectively 19.3 ± 1.4 and 29.5 ± 1.3 . The levels of radial height were respectively 10.8 ± 0.3 and 12.5 ± 0.5 and the level of palmer tilt was respectively 10.9 ± 0.3 and 13.1 ± 0.9 . (table 1). The median of DASH scores after six weeks and six month after reduction were 34.1 and 7.5 respectively. The level of patients DASH score after six weeks was stated as follows: 18 patients (18.7%) had score of 75-100, 16 patients (16.6%) score of 50-75, 57 patients (59.3%) scored between 25-50 and 5 patients (5.2%) score of 0 to 25.

Table 1: radiographic parameters: palmer tilt, radial height & radial inclination

Parameters	radial inclination(degree)	radial height (mm)	palmer tilt (degree)
Before reduction	19.3 ± 1.4	10.8 ± 0.3	10.9 ± 0.3
After reduction	29.5 ± 1.3	12.5 ± 0.5	13.1 ± 0.9
One week after reduction	29.4 ± 1.5	12.3 ± 0.8	13 ± 0.7
two weeks after reduction	29.3 ± 1.6	12.2 ± 0.9	12.9 ± 0.6
three weeks after reduction	29.2 ± 1.7	12.1 ± 0.8	12.8 ± 0.9

Significant differences were observed between the mean values of radial inclination, radial height and palmer tilt before and after the dislocation ($p < 0.01$). Comparison of radiographs times during a week, two weeks, and three weeks after reduction with radiographic parameters after reduction did not show significant differences. Also, no significant difference was found between the age, sex and radiographic parameters of patients with DASH scores. There was no significant correlation between DASH scores and radiographic parameters.

DISCUSSION

In this study, the closed reduction method for treatment of distal radius fractures in emergency department of Shohada e 7 Tir hospital were considered in 2012. Evaluating the DASH questionnaire showed that the median score of 34.1 in one month after removing the cast and 7.5 after six month of follow up. Also the Radiography results showed that closed reductions in distal radius fractures are well done and the values of radial inclination, radial height and palmer tilt were close to the normal range. (the normal values for radial inclination, radial height and palmer tilt are 20-25 degrees, 11.6 ± 1.6 mm and 11.2 ± 4.6 degrees respectively).

Previous studies conducted in the manner of closed reduction in fracture of distal radius imply a positive change in radial inclination; radial height and palmer tilt after closed reduction in the patients (10) which is consistent with the results of the present study.

Method of reduction in fractures without the need for surgery is one of the hard affairs in the treatment (11-13). In further studies, physicians trying to get back to the normal anatomy of bone in 60 to 70 percent of fractures failed (14, 15).

26 patients who were admitted to the emergency department and were excluded from the study, the closed reduction method was not efficient for them and therefore they required surgical treatment. In this way it would be a bit difficult to predict whether closed reduction is efficient or not which depends to the experience and skill of the specialist.

In a retrospective study (16), the risk factors associated with failure of reduction of fractures were as follows: More than 60 years of age, grade <20 of dorsal angulations, radial shortening, dorsal comminution, ulnar fracture or intra-articular radio carpal involvement (17). In addition, the reduction of bone density might lead to unstable fractures of the radius and the increase the risk of dislocation (18). In the present study, no correlation was found between age and sex with the results of the DASH questionnaire.

Unlike previous study that 60% of people over age 60 had fractures of the distal radius (10). In the study that was performed in the past regarding the efficiency of closed reduction in fractures of the distal radius, follow-up of patients was done for one year which showed that all patients had fully got back their abilities and they had good satisfaction for their treatments (10). In the present study, follow-up and examinations of patients and completing DASH questionnaire showed that the majority of those patients who underwent closed reduction were treated well done. Our findings are consistent with previous findings. Of the 18 people who had a poor performance in the DASH questionnaire after six weeks (DASH score 75-100), 8 persons aged between 40-50 years and 10 cases had inappropriate care during their treatment. In another study in the treatment of distal radius fractures, the closed reduction and pin compared to the closed reduction and casting was reported with a safer and fewer side effects. The level of patients' satisfaction with treatment was higher in the first group (93% compared to 81.8%). While in the present study, no side effects were seen in patients in the follow-up period. While in the mentioned study, the symptoms of infection of pin tract was 15.1 % which is one of the weaknesses of pin in plaster compared to the closed reduction method and casting (21,26).

In the study by Hans et al (22,27), better functional, clinical and radiographic outcome was seen in patients treated with closed reduction and external fixation compared to closed reduction and casting. In some studies reduction took place in operating room under general anesthesia and in some studies it took place with sedation and in some cases with local anesthesia. In the previous studies (19,20,28), those patients who were under general anesthesia for the next reductions, they had better results in follow-up. In the present study after deep sedation with fentanyl and thiopental in patients, the reduction was done and it was followed up with good satisfaction of patients.

Limitations

This study has some limitations. The number of patients participating in this study was small (96 patients) and the research was done in just a large medical center in Tehran. Hence further studies are required in different communities and medical centers. The follow-up of patients can be longer and in a duration of one to two years. In this study, the bone density of patients was not recorded. BMD is an important and effective factor in bone fractures that the physicians might change their decisions regarding the performance of medical method for distal radius fractures method in case of having a problem with this factor. It would be helpful to do studies for comparing closed reduction with operation

Conclusion

Radiographic outcomes of patients participating in this study showed that closed reduction has taken place in an accurate way and the parameters of radial inclination, radial height and palmer tilt after reduction had positive and significant changes which indicates the return of normal anatomy of distal radius bone. On the other hand the follow-up of patients after reduction through DASH questionnaire showed that the patients had a good performance about the treatment according to the radiography results. The results of this study showed that closed reduction for distal radius fractures can be considered as successful, cheap and satisfying medical method in the emergency department for patients with distal radius fractures.

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