
Redisplacement Rates after Reduction and Cast Immobilization of Isolated Distal Radial Fractures

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Abstract

Background

The maintenance of satisfactory alignment in distal radial fractures following closed reduction and casting of the forearm is challenging. Redisplacement rates of between 2 and 91% have been described, mostly for Western populations and for fractures involving both the forearm bones. The local scenario is unexplored.

Objective

This study sought to determine the rate of redisplacement in isolated closed distal radial fractures in children aged 6-15 years and the factors contributing to the redisplacement.

Setting

The Kenyatta National Hospital, a teaching and referral hospital in Kenya.

Patients and Methods

This was a prospective study carried out between June 2005 and February 2006. Patients were recruited from casualty, where the fracture was reduced and casted. Immediate check x-rays were taken to ascertain satisfactory alignment. At follow up the fractures were evaluated for redisplacement in the fracture clinic in the second and

fourth weeks with further check x-rays. Redisplacement was regarded as the presence of dorsal or volar-angulation of greater than 20°. The data was collected and entered into statistical package for social sciences (SPSS) 12.0 version. Comparison of the binomial outcomes of the factors determining the redisplacement of the distal radial fractures was carried out using Fischer's exact test. P value <0.05 was taken to be significant.

Results

Ninety-two patients were evaluated. Overall redisplacement rate was 15.7%. Factors significantly associated with redisplacement included initial displacement, completeness of fracture and non-satisfactory initial reduction.

Conclusion

The rate of redisplacement of 15.7% reported here is within the range that is considered acceptable. The success of re-manipulation at the KNH is unsatisfactory. Percutaneous K-wiring should be considered for those with complete fractures with displacement that do not achieve perfect reduction at initial check radiographic film.

Introduction

Distal radius fractures are common injuries in children and affects boys more than girls (1). Isolated distal radial fractures can result from indirect trauma involving angular loading combined with rotational displacement. Traditionally, these fractures have been treated by closed reduction and immobilization in a plaster cast. This method of treatment is however associated with various rates of redisplacement and malunion (1-5), especially for fractures involving both the ulna and the radius and not the latter in isolation.

Reports from the West and East indicate that success of the reductions, performed by surgeons and orthopaedic residents, is influenced by the initial displacement, presence of ipsilateral ulnar fracture, amount of cortical disruption and type of analgesia the reduction is performed under as well as how well the fracture is reduced (3,6).

It is unclear whether similar results obtain in our set up, where reduction and casting are performed by plaster technicians. This study sought to determine the rate at the KNH and factors affecting redisplacement after reduction and casting.

Patients and Methods

Design:

This was a prospective hospital based study that was carried out between June 2005 and 2006.

The patients were recruited from the KNH casualty department. The inclusion criteria included closed isolated radial metaphyseal fracture, age 6-15 years and consent from the parents of the patients who presented themselves within 24hrs of injury. The patient's demographic data and parent's socioeconomic status (low socioeco-

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conomic status were those earning less than \$125, while middle those who earn \$125-375 per month) were recorded as well as the characteristics of the fracture such as displacement (angulations, translations, direction of displacement) and completeness from the initial radiographic film. The reductions were performed by plaster technicians under sedation for all the patients, as is the standard procedure at the institution, after which check radiographic films were reviewed to assess for adequacy of reduction. All the casts were short arm casts in the manner described by Charnley (7). Because this was an observational study, the technicians were not particularly trained for any type of reduction or cast other than the ones they do for these types of fractures (i.e. complete casts). The initial check radiograph after reduction was used to assess the adequacy of reduction and those which were not satisfactorily reduced were immediately remanipulated under sedation.

The patients were reviewed the following day to check on swelling or check films if not available on the day of reduction at the fracture clinic. Follow up was done in the second and fourth week for all the patients in the fracture clinic. Those who had fracture redisplacement during reviews at second week were remanipulated under sedation. Those whose fractures showed signs of redisplacement at four weeks were admitted for operative reduction. Redisplacement was regarded as the presence of dorsal or volar angulation of greater than 20°. This was estimated using a protractor due to the unavailability of goniometer.

Results

Of the one hundred children recruited into the study, 92 had isolated metaphyseal radial fractures. Fifty-nine (64.1 %) were male, fifty-two (56.5 %) were aged below 10 years, and forty-one (44.6%) were of low economic status. The proportion of fractures that were complete, displaced and perfectly reduced was 63 % (58), 42.4% (39), and 51.3 % (20, n=39) respectively (Table 1).

During the evaluation at two weeks, 83 of the 92 patients presented for follow up assessment. According to the check radiographic films reviewed, 15.7% (13) of the fractures were redisplaced.

In the fourth week, 76 patients were available for follow up evaluation (71 of these were part of those evaluated at two weeks). Only the 71 consistent patients were therefore used in analysis. The proportion of the group that had redisplacement was 15.7%.

The demographic characteristics of the patients did not significantly influence redisplacement. The fracture characteristics significantly influenced redisplacement with P values of < 0.001 for displacement, 0.003 for completeness of fracture and 0.028 for whether or not the reduction was satisfactory (Table 1).

Discussion

Although the traditional treatment of distal radial fracture by reduction and immobilization in a cast is associated with good functional results (8, 9), loss of reduction in the cast is a well-documented problem (8,9). The quoted rate of redisplacement ranges from 2 to 91 % (1, 3, 8, 9, 10, 11).

In this study, we considered only isolated radial fractures. The displacement rate of 15.7% after four weeks of follow up is within the range of most of the quoted studies. Gibbon et al prospectively evaluated 12 patients with isolated radial fractures and reported a remanipulation rate of 91% by the time of union. Only two patients seemed to have had successful remanipulation in the current series. Eleven out of the 13 needed operation. The success rate for our remanipulation seems inferior to those of Gibbon et al (10). A consideration for percutaneous K wiring may be required as the primary treatment where the risk of redisplacement is high.

Remanipulation was performed in the second week in our study. Previous studies have reported successes up to day 24 post- fractures (10, 11) with rates in their study of

	Number	%
Completeness		
Incomplete	34	37
Complete	58	63
Displacement		
Non	53	57.6
Displaced	39	42.4
Reduction		
Imperfect	19	48.7
Perfect	20	51.3

Table 1. Distribution by fracture characteristics

7%, probably due to their aggressive nature in remanipulation.

The risk factors that have been considered to be significant in contributing to redisplacement in other studies have been initial displacement and failure to achieve perfect reduction (9,3,11,13). The initial displacement includes angulations and direction of displacement. The significant factors in the current study were similar to these. Demographic and socioeconomic variables did not have any effect.

This study was limited by the number of patients lost to follow up. Ten percent of the patients were lost by two weeks and only 77.2% were available for evaluation at four weeks. Further limitations included the lack of instruments such as goniometer and the observational nature of the study. Plaster technicians were utilized in this study, a design substantially different from other reported studies where orthopaedic surgeons and residents performed the manipulations.

We conclude that the rate of redisplacement is significant but within the range that could be considered acceptable. However, our results of remanipulation were poor. Percutaneous K-wiring should be considered for those with complete fractures with displacement.

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Factor	Displaced	Not displaced	P-value (*Fischer's)
Age			
6-10	6	40	
11-15	7	30	0.333
Gender			
Male	10	42	
Female	3	28	0.201*
Parents socioeconomic status			
Low	5	28	
Middle	8	42	0.586
Fracture Completeness			
Incomplete	0	28	
Complete	13	42	0.003*
Displacement			
Non displaced	1	46	
Displaced	12	24	< 0.001*
Reduction			
Non satisfactory	5	14	
Satisfactory	8	12	0.028

Table 2: Predictors of redisplacement at 2 weeks

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