



ORIGINAL RESEARCH PAPER

Orthopaedics

**FRACTURES OF THE DISTAL RADIUS-ULNA IN PEDIATRIC AGE GROUP TREATED WITH K-WIRES ACROSS THE PHYSIS**

**KEY WORDS:** Pediatric fractures, Lower end radius/ulna, Physis, K wire

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**ABSTRACT**

Fractures of the distal radius and ulna in children are treated either with a cast or by pins. The aim of this study was to assess the outcome of fractures of the distal radius and ulna in pediatric age group with K wires passed across the physis. Thirty-five children with fractures of the distal radius and ulna treated by K wires passed across the physis were followed for a minimum period of six months. Patients were evaluated clinically and by radiology using Green-O'Brien and Sarmiento criteria respectively. All cases in this study went to perform excellent on all scales of outcome. However, Green-O'Brien score showed significant association with both the degree of displacement of fractures and isolated radius and radius-ulna fracture combinations.

**INTRODUCTION**

Physal fractures of distal radius and ulna are quite frequent presentation in regular orthopedic practice. Displaced fractures of distal forearm are generally reduced and stabilized by cast. However, re-displacement is a common complication after such closed reductions and casting.<sup>(1)</sup> Displacement of these fractures can be prevented by stabilizing the fracture with K-wires. K-wires placed just proximal to physis decrease the risk of physal disturbance but, outcome of fracture fixed with smooth pin across the physis has not been well demonstrated in published literature. The aim of this study was to assess the outcome of distal radius-ulna fractures in pediatric age group fixed with K-wires passed across the physis.

**METHODOLOGY**

This study was carried out at a tertiary level care teaching hospital after due ethical clearance. All skeletally immature patients between 5 to 16 years of age with recently (<1week) fractured distal radius and ulna with an indication for surgical treatment were included. Patients with pathological fractures, crush injuries and any associated injury that could affect outcome were excluded. All fractures were reduced with traction under anesthesia and fixed with wires placed across the physis. Typically one wire was inserted through each column of the distal radius-ulna.<sup>(2)</sup> (Fig.1) Reduction was accepted as per guidelines (Table 1)<sup>(3)</sup> generally followed.

**Table 1. Recommended acceptable alignment parameters for pediatric distal forearm fractures.**

Source	Age (years)	Angulation (degrees)	Malrotation (degrees)	Bayonette apposition /displacement
Price	<8	<15	<30	100% displacement
Noonan	<9	<15	<45	<1cm short
Tarmuzi	<10	<20		No limits
Qairul	<12	<20		



**Fig1. Trauma and fixation x-rays**

Manipulation for achieving reduction was done for a maximum of two times in every case. Post-operatively immobilization was advised for 4 weeks after which intermittent mobilization was

started. Wires were removed between 6 to 8 weeks. Patients were followed-up periodically for a minimum of 6 months. Patients were evaluated clinically and by radiology using Green-O'Brien and Sarmiento criteria respectively.

**OUTCOME AND RESULTS**

During the period between January 2016 to June 2017, 35 cases based on the inclusion and exclusion criteria were identified. With 5 patients being lost to and/or inadequate follow-up, we had 30 patients (M28, F2) for final analysis. Majority (n=21) of the patients had combined radius-ulna fractures. Metaphyseal fractures (n=23) outnumbered physal injuries (S-H Type II). An average angulation of 18.8° on antero-posterior and 29° on lateral radiograph were seen in radius. An average angulation of 7.33° on antero-posterior and 9.36° on lateral radiograph were seen in ulna. Translation up to 40% on antero-posterior and lateral view of x-ray was commonly noted. Acceptable reduction was achieved in most of the cases (n=26). Average union time was 6.13 weeks and peak union time was between 4 to 8 weeks. No significant association between time to union and fracture combinations were found. All patients had excellent results on clinical assessment and on radiology assessment (Table 2).

**Table 2. Clinical and radiological assessment criteria**

Scoring system	Worst possible score	Best possible score	Min-Max score in this study
Green-O'Brien	<65	90-100	90-100
Sarmiento score	16	4	4-5

**Table 3. Green & O'Brien score vs. fracture combinations**

Green-O'Brien clinical score	Fracture Radius (n)	Fracture radius ulna(n)
100	6	20
90	3	1
p-value	0.035(<0.05) Significant	

Significant association was found between clinical scoring system and fracture combinations (Table 3). This proves that the clinical results of isolated distal radius fractures differ from that of combined radius-ulna fractures treated with K-wires in children.

**DISCUSSION**

The gold standard treatment for pediatric distal forearm fractures remains closed reduction and casting.<sup>(4)</sup> Although conservative treatment is preferred for young children (<9 years), criteria for acceptable angulations and displacement varies in literature. It is generally accepted that the closer the fracture is to the distal physis, the greater the potential for remodeling.<sup>(5)</sup> Due to the greater forces borne and imparted to the radius, as well as the increased porosity of the distal radial metaphysis, distal radial fractures do occur more frequently than the combined variety.<sup>(5,6)</sup> However, in contrast to these facts, radius-ulna combined fractures (n=21) outnumbered those with isolated fractures of the distal radius (n=9) in this study. Statistical analysis proved no

association between age and fracture combinations.

Distal radius-ulna fractures have been shown to have a high degree of recurrent displacement with conservative treatment. Hence except for those fractures presenting with an initial x-ray showing anatomical reduction, we preferred to pin all fractures for fear of eventual loss of reduction. Average time to union in this study was no different from other similar studies available in literature; although, we had more combined radius-ulna fractures. Functional outcome following distal radius fractures are directly influenced by the choice of outcome assessment instruments used.<sup>(7)</sup> The Cooney modification of the Green and O'Brien score is an examiner related assessment of pain, functional status, range of motion and grip strength. This system has a strong correlation to DASH in both its raw score and final grading. The Sarmiento score (Modified from Lidstorm and Frykman) considers deformity, volar-dorsal angulations, shortening and radial deviation in assessing the radiological outcome of these fractures. It is not surprising that all cases in this series went to perform excellent on all scales of outcome. However, the Green and O'Brien score showed significant association with both the degree of displacement of fractures and radius and radius-ulna fracture combinations.

We conclude that closed reduction and pinning across physis is a safe and effective means of treating distal radius and ulna fractures in children. However, considering small sample size and short time of follow-up, we suggest further studies to clearly establish the results of pinning across the physis in fractures of distal radius-ulna in children.

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