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ORIGINAL ARTICLE

Supracondylar Displaced Fracture of Elbow in Children Treated with Closed Reduction and Percutaneous K Wire Fixation

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ABSTRACT

Objective: To compare the closed reduction and percutaneous K wire fixation method outcomes in the treatment of supracondylar displaced fracture of elbow in children.

Study Design: Prospective study

Place and Duration of Study: Department of Orthopaedics, Arif Memorial Teaching Hospital, Lahore from 2nd April 2021 to 31st September 2021.

Methodology: One hundred and seventy children were included. Those children having supracondylar displaced fractures of elbow with a grade 3 were included in the study as participant. K wires of 1.5-2cm were used after closed reductions were satisfactorily achieved. Padded-Back slabs at posterior position of elbow were applied. At 2 weeks' suture removal and pin configuration was also observed. Callus production was observed through radiological x ray images.

Results: Majority of the children belonged to the age group of 6-10 years. There were 59.4% males while 40.58% were females. Within the total number of cases 55% were administered two lateral parallel K wires while 45% were administered cross K wire. Pin tract infection was formed in 2.5% of lateral K wire cases while it was observed in only 1.2 % of Cross wire cases. Most of the children got the fracture while playing a sport. The recovery phase was of 3.5 months while fracture joined in a mean value of 1 month.

Conclusion: Lateral percutaneous pin technique for the management of supracondylar fracture of humerus bone is a more suitable method and offers same results without involvement of iatrogenic ulnar nerve injury.

Keywords: Humerus, Ulnar nerve, Pin method, K-wire, Deformation

INTRODUCTION

Supracondylar fractures of displaced humerus bone of elbow are commonly presented in children of all ages. The prevalence of 50-70% of all the fractures present in children globally. The main reason of this fracture is considered as careless playing and running.[1] Proper joining of the fracture is the most significant part to achieve as to save lifetime deformation in a child.[2]

The recently used protocol for achieving fracture treatment for supracondylar displaced humerus is founded on Gartland classification. In the study of Flynn and his colleagues[2], incidence of deformity related with cubus-varus has been identified as 5% in children while similar has been reported up to 21% in another research by Arino et al.[3] These scientists also reported ulnar nerve damage in 15% of the cases treated with medial/lateral pin method. Similar results have been shared in other researches over the globe.[4,5]

Various methods and techniques applied for treatment of supracondylar displaced fracture of elbow has been detailed with close reduction as well as arm cast or slab formation, Dunlop skin-traction most commonly reported. However, many of these techniques have also been found to have high range of complication. However, closed reduction with the application of K wire has been reported as safe reliable procedure.[6-12] The present study was designed to assess the closed reduction and percutaneous K wire fixation both through cross wire and lateral K wire application. This study aimed to determine the most efficient procedure which could be used for the treatment of elbow fractures in children with least complications

MATERIALS AND METHODS

This prospective study was conducted at Department of Orthopaedics, Arif Memorial Teaching Hospital Lahore from 2nd April 2021 to 31st September 2021. An informed consent was taken from parents/guardians of each child. Those children having supracondylar displaced fractures of elbow with a grade 3 were included in the study as participant. Patients who had bone disease and low immune response were not included as study participant. A total of 170 children were included in this study. The sample size was calculated through sample size calculator based on 80% power of test and 95% CI. The operation was performed within 1-8 days of fracture. General anesthesia was given for surgery by using c arm fluoroscopy for achieving closed reduction. K wires of 1.5-2cm were used after closed reductions were satisfactorily achieved. Padded-Back slabs at posterior position of elbow were applied. Each patient was monitored up to 72 hours post operation. Plaster back slabs and pins were removed at 3-4 weeks and elbow range-motion was assessed. Wound inspection was followed at day 7 then at 2 weeks. At 2 weeks suture removal and pin configuration was also observed. Callus production was observed through radiological X-ray images. Further follow ups were conducted at 4,8 weeks and finally at 6 months in combination with physiotherapy sessions. Clinical information as well as demographic details was entered in a well designed questionnaire. Statistical analysis was completed using SPSS version 26.0. Chi square test was used with a p-value <0.05 as significant.

RESULTS

Majority belonged in age group of 6-10 years. There were 59.4% males while 40.58% were females. There was a significant difference between genders of cases (Table 1). Within the total number of cases 55% were administered two lateral parallel K wires while 45% were administered cross K wire depending on their clinical condition and requirement. Pin tract infection was formed in 2.5% of lateral K wire cases while it was observed in only 1.2 % of Cross wire cases (Fig. 1).

The clinical history of the patients showed the presence of 61.7% such cases with left sided fracture of supracondylar of elbow while 38.2% only had right sided elbow fractures. Most of the children got the fracture while playing a sport. There were 91.7% cases of extension. In preoperative state the nerve injury was presented in total 10 cases with highest of median nerve injury, while post operatively only 07 cases presented ulnar nerve injury. The recovery phase was of 3.5 months while fracture joined in a mean value of 1 month (Table 2).

The posteroanterior imaging results of closed reduction using cross Kwire were also compared with the lateral imaging

(Fig. 2). At twenty-four weeks follow up the cases of cross k Wire were higher in excellent score than lateral cases. However, the difference was not significant with almost similar number of scoring also observed for the lateral K wire pin insertion procedure (Table 3

Table 1: Age and gender distribution of cases

Variable	No.	%	P value
Age (year)			
1-5	55	32.3	0.65
6-10	65	38.2	
11-15	50	29.4	
Gender			
Male	101	59.4	0.04
Female	69	40.58	

Table 2: Analysis of fracture and nerve injury

Variables	No.	P value
Fractures		
Left Sided	105 (61.7%)	<0.05
Right Sided	65 (38.3%)	
Cause of Fracture		
Playing	112 (65.9%)	<0.05
Accident	58 (34.1%)	
Extension	156 (91.7%)	<0.05
Flexion	14 (8.3%)	
Preoperative Nerve injury		
median	5 (2.9%)	0.65
ulnar	3 (1.8%)	
Radial	2 (1.2%)	
Postoperative Nerve injury		
Ulnar	7 (4.11%)	--
Postoperative nerve recovery (months)	3.5±0.5	
Duration of fractures joining	1±0.3	

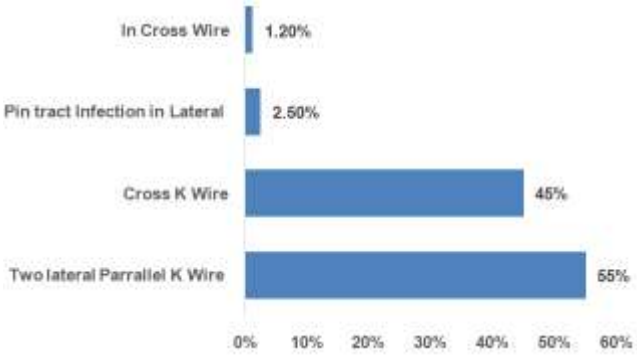

Fig. 1: comparison of lateral and cross wire application and infection rate

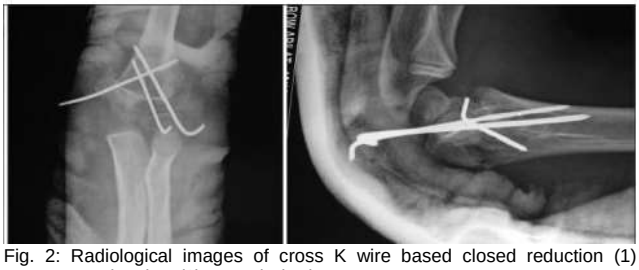

Fig. 2: Radiological images of cross K wire based closed reduction (1) Anteroposterior view (2) Lateral View)

Table 3: Table comapriason of Cross and Lateral pin insertion

Grades	Eight Weeks		Sixteen weeks		Twenty-four Weeks	
	Cross	Lateral	Cross	Lateral	Cross	Lateral
Excellent	70	55	73	72	74	72
Good	19	18	9	6	8	7
Fair	4	1	4	3	4	3
Poor	2	1	2	1	2	-
P value	0.88		0.91		0.85	

DISCUSSION

Supracondylar fracture of humerus can mainly and effectively be treated and managed with percutaneous pin fixation and close reduction in contrast with other treatment methods. Though, controversial findings are present regarding pin fixation management either with lateral or mediolateral pin fixation. The present study was designed to assess the closed reduction and per cutaneous K wire fixation both through cross wire and lateral K wire application. Purpose of the study was to find the most effective method by comparative analysis for fractured humerus bone.

Ulnar nerve injuries and pin tract infections were also documented in present study. Pin tract infection was formed in 2.5% of lateral K wire cases while it was observed in only 1.2 % of Cross wire cases. Studies showed that, pin fixation method can avoid ulnar nerve damage however, this construct is thought not be a safe biomechanically.[13,14] Few other studies also suggest use of third wire to avoid distal fragment displacement. But it can elevate the chances of pin penetration in joints and increased risk of infection.[15,16] Skaggs et al[17] determined that, no ulnar nerve palsy was noted and no effect was found on Baumann's angle on treatment either with crossed or lateral pins.

In present study, follow-up was taken up to 24 weeks of the treatment. The cases of cross K wire were higher in excellent score than lateral cases. However, the difference was not significant with almost similar number of scoring also observed for the lateral K wire pin insertion procedure. Physiotherapy can also play a beneficial role in the management and early movement and healing of the fractured or newly joined bone, certain time after surgical method. Those patients who were showing poor results might have soft tissue injuries. Similar has been reported by other studies.[18-20]

CONCLUSION

Lateral percutaneous pin technique for the management of supracondylar fracture of humerus bone is a more suitable method and offers same results without involvement of iatrogenic ulnar nerve injury.

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