



COMPARISON OF PERCUTANEOUS CROSS VERSES PARALLEL K WIRE FIXATION IN SUPRACONDYLAR FRACTURES OF THE HUMERUS IN CHILDREN.

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ABSTRACT: Objectives: The aim of this study is to summarise and compare the radiological and functional results of two ways of fixation (cross and parallel closed K wires) of supracondylar fractures in children. **Study Design:** Randomized controlled trial. **Setting:** Department of Orthopaedics Surgery, Services Hospital, Lahore. **Period:** 1st January 2018 to 31st June 2018. **Material & Methods:** We included 180 patients (90 in each group). **Results:** The mean age was 6.45 ± 2.34 years with 115(63.9%) male and 65(36.1%) female. Among the children who underwent fixation with cross k-wires, ulnar nerve injury was seen in 2(2.2%) cases and none were seen in the other group post operatively. Group A attained higher union rate at last follow up. 4(4.4%) cases in Cross K-wires and 19(21.1%) in two lateral k-wires gave outstanding outcome. In a nutshell, 60 in group A and 45 in group B showed excellent outcomes based on Flynn's criteria, p-value < 0.05. **Conclusion:** According to Flynn's criteria, closed percutaneous cross K-wire fixation of supracondylar fracture of humerus is an effective management option in terms of finer functional results as compared to Parallel k-wires. Although, the rate of radiological union is higher in cross k-wire fixation, there are 2.2% chances of ulnar nerve injury.

Key words: Close Reduction, Humerus, K-wire Fixation, Percutaneous Pinning, Parallel and Cross Wires, Supracondylar Fracture.

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INTRODUCTION

Supracondylar fractures are common in children and are associated with significant morbidity.¹

Supracondylar fractures of the humerus represent 50-70% of all elbow fracture in children in the first decade of life. Current method of treatment of this fracture is based on Gartland classification.²

Out of the common complications associated with supracondylar fractures, some complications like mal-union, ischemic contracture and neurovascular damage are worrisome.³

Closed manipulation and percutaneous pinning of displaced supracondylar humeral fractures is commonly performed in the UK using two crossed pins or two lateral pins. Accurate reduction and stable fixation is key to the successful surgical treatment of these fractures, but this is often hampered by soft tissue swelling and gross

fracture instability.⁴

Closed reduction and percutaneous Kirschner wire (k-wire) fixation is the preferred method of treatment in Gartland type 3 supracondylar humerus fractures in children.³

Lateral percutaneous pinning technique, of displaced supracondylar fractures of the humerus offers a viable alternative to the crossed pinning group as it offers the same stability without the incipient risk of iatrogenic ulnar nerve injury.^{5,6}

Closed reduction and percutaneous K-wire fixation is the standard method of managing displaced extension type supracondylar humerus fractures. Many investigators have used two crossed pins: one introduced medially and one laterally.^{5,7}

One trial found that excellent functional outcome (<5° motion loss) was observed in 81.8%

cases with cross K-wire and 73.9% with parallel K-wires fixation ($p>0.05$). But Baumann's angle was $73.09\pm 4.888^\circ$ with closed reduction with cross K-wire and $76.05\pm 3.240^\circ$ with parallel K-wire fixation ($p<0.05$) for management of supracondylar humeral fracture in children.⁸

Rationale of this study is to compare the outcome of closed reduction and percutaneous cross versus parallel K-wires fixation in supracondylar humeral fracture in children. Literature reported that parallel technique is more effective in the management of supracondylar humeral fracture in children. But insignificant results have been observed.⁸

Moreover, not much work has been done in this regard and local evidence also lacks. So there is a need to find the evidence to assess the best method for management of supracondylar humeral fracture in children. So, we want to conduct this study to get evidence regarding more effective and successful method for management of supracondylar humeral fracture in children. So that we may be able to implement the results of this study in local setting and apply more successful method in future.

METHODOLOGY

In this study 180 children were selected from the Accident & Emergency and Orthopaedic Outpatient Department of Services Hospital Lahore from the duration of 1st January 2018 to 31st June 2018. Children with supracondylar fracture of humerus of either gender were selected, and those of ages above 16 years (the age of skeletal maturity) were excluded.

Patients presenting with complications of the

fracture at the time of presentation were excluded from the study. After taking an informed consent from the guardians, name, age and gender were stated in statistics. Total patients were divided into two groups (A and B). The fractures of the children in group A, were reduced by closed technique under C Arm control with wire in cross manner, whereas the fractures in group B were managed by parallel wires. Every patient of both categories was given a padded dressing and back slab was applied.

The patients were kept under observation for 12-24 hours and were discharged the next day after their full evaluation of neurovascular status. The patients were called for follow up at 1,2, 4, 6 and 12 weeks during which complete history, Physical examination and radiographs were recorded, Recording of Range of motion using Flynn's criteria (Table 1) for loss of motion and loss of carrying angle, was used. Splints were taken off after 4 weeks of surgery, followed by rehabilitation.

RESULTS

The mean age was 6.45 ± 2.34 years with 115(63.9%) male and 65(36.1%) female. Among the children who underwent fixation with cross k-wires, ulnar nerve injury was seen in 2(2.2%) cases and none were seen in the other group post operatively.

Group A attained higher union rate at last follow up. 4(4.4%) cases in Cross K-wires and 19(21.1%) in two lateral k-wires gave outstanding outcome. In a nutshell, 60 in group A and 45 in group B showed excellent outcomes based on Flynn's criteria (Table 2), p -value < 0.05 .

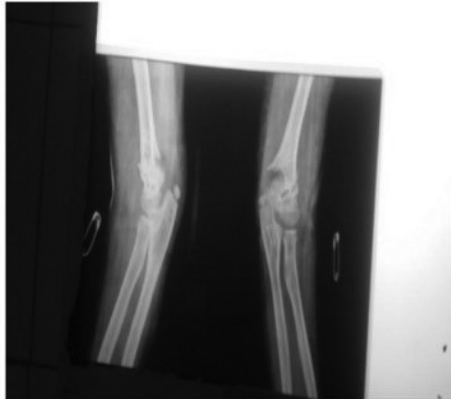
Grading	Loss of Carrying Angle of Elbow	Loss of ROM at Elbow
Excellent	0-5 °	0-5 °
Good	6-9 °	6-9 °
Fair	10-15 °	10-15 °
Poor	>15°	>15°

Table-I. Flynn criteria ROM = Range of Motion

Grading	Loss of Carrying Angle of Elbow	Loss of ROM at Elbow	Group A	Group B
Excellent	0-5 °	0-5 °	60	45
Good	6-9 °	6-9 °	26	32
Fair	10-15 °	10-15 °	4	13
Poor	>15°	>15°	0	0

Table-II. Results according to flynn criteria ROM = Range of Motion

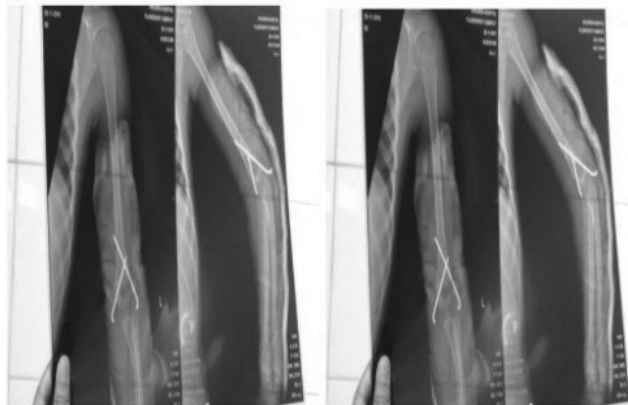
Case1



Case 2



Pre-op (AP and Lateral views)



Pre-op (AP and Lateral views) Post-op (AP and Lateral views)



Post op (AP and Lateral views)

DISCUSSION

Being the most common elbow fractures (1/3rd of all fractures that occur in children⁹) supracondylar fractures usually occur in 2-8 years of age, mostly affecting the left limb. These are more common in boys.¹⁰ In one study, mean age of patients was 6.41 ± 2.37 with boys.¹¹

Mean age in cross k-wires and two lateral k-wires was 6.24 ± 2.94 and 6.61 ± 1.24 years respectively with no prominent difference p value > 0.05.

These are mostly caused by low energy trauma

and are categorized on the basis of injury pattern, which are extension and flexion types respectively. Injury caused by extension occurs due to fall on the palm of hand with hyperextended elbow (most common), while direct fall onto fixed elbow results in flexion type of these injuries.¹² Out of these traumatic injuries, displaced ones are consequently known for neurological and vascular issues. Surgery is recommended in such cases, for casting and immobilizing the elbow often results in neurovascular complications, however the type of procedure is still debatable.

Various treatment options are available, e.g. different configurations of k-wires like two parallel, divergent or cross k-wires (medial and lateral) and POP case for un-displaced fractures. Each has its own merits and demerits, for instance, laterally placed divergent pins protect the ulnar nerve and provide equal stability like cross wire. Overall, divergent pattern is more stable than parallel one.¹³

The procedure of Closed reduction and internal fixation is although performed with patient lying in supine position, one study however, reported a new technique of reducing a Displaced Supracondylar humeral fracture by traction and gradual extension in the prone position.¹⁴

On the other hand, typical current management for displaced fracture is closed reduction and percutaneous K wire fixation, which has consistently given excellent results reported by various authors.¹⁵ However, consensus has still not been made on the arrangement, whether cross or two parallel lateral wires are better in terms of stability and iatrogenic ulnar nerve damage which formed the rationale of this study. Ideally medial and lateral pins engage medial and lateral columns at injury site, whereas, lateral pins stabilize lateral and central columns.

According to a study in 2011, medial and lateral cross k-wires fixation group gave 72% excellent and 28% good results, while similar outcome were found in 2 lateral k-wires group.¹⁶

The cross wires have been demonstrated in biomechanical studies and clinical trials to be more stable configuration than others (Braner et al 2007). Conversely, lateral pins have been used by all except to avoid ulnar nerve injury, however it is considered less stable biochemically.

CONCLUSION

According to Flynn's criteria, closed percutaneous cross K-wire fixation of supracondylar fracture of humerus is an effective management option in terms of finer functional results as compared to Parallel k-wires. Although, the rate of radiological union is higher in cross k-wire fixation, there are

2.2% chances of ulnar nerve injury.

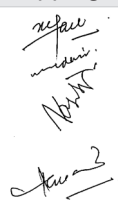
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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
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2	Mudasser Saddique	Surgeries + Data collection.	
3	Hafiz Nasir	Data collection.	
4	Ahmad Shams	Data collection.	