

## Functional and Radiological Outcome of K Wire Fixation in Pediatric Supracondylar Humerus Fracture

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### Abstract:

**Background and Aim:** The therapy of displaced supracondylar humerus fractures in children is frequently difficult. The doctor caring for these patients encounters management pitfalls often and on a consistent basis, particularly when it comes to displaced supracondylar fractures. This study compares and contrasts the effectiveness of the two pinning methods for children with humeral supracondylar fractures.

**Material and Methods:** The present study was done for the period of one year, in the Department of orthopedics with the association of the department of paediatrics, in the medical college and associated hospital. The included patients were divided in group A and group B. Each group consisted of 20 patients, total of 40 patients were included in study. The fracture of patients in group A was fixed with two laterals cross Kirschner wires configuration and fracture of patients in Group B was fixed with mediolateral cross Kirschner wires configuration. Range of motion, carrying angle and presence of neurological deficits were measured and were rated as poor, fair, good and excellent on the basis of the patient's evaluation.

**Results:** All of the fractures were type III Gartlands, affecting 16 patients on the right side and 24 patients on the left. There were no significant differences ( $p > 0.05$ ) between groups with regard to any of these variables except 4 cases in group B had iatrogenic ulnar nerve palsy which needed pin removal which recovered subsequently.

**Conclusion:** Closed reduction and percutaneous criss-cross K-wire fixation are effective treatments for displaced supracondylar humeral fractures. With the exception of ulnar nerve damage, neither group experienced any serious complications. The functional outcome appears to be the same in both groups. Although technically difficult, it is essential to perform this method with fluoroscopy assistance.

**Keywords:** Children, Closed reduction, K-wire fixation, Supracondylar Humerus Fracture.

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### Introduction

The majority of elbow fractures in children are humeral supracondylar fractures, which account for 50–70% of all elbow fractures. These fractures account for around 3% of all paediatric fractures. Maximum numbers of fractures are seen between 5 and 7 years old, and the incidence of these fractures gradually rises with age. These fractures, which are among the most frequent ones in children, are brought on by a child falling while holding out their hand.[1,2]

In the first ten years of life, 50–70% of all elbow fractures in children are humeral supracondylar fractures. This fracture makes up about 3% of all paediatric fractures. In the first five years of life, the rate of incidence gradually rises, reaching a peak between the ages of 5 and 7. As a result,

supracondylar fracture of the humerus, which typically affects males and occurs as a result of a fall onto an extended hand, is one of the most discussed and frequently observed injuries in children.[3,4] Due to the considerable capacity for bone development and remodeling in children, paediatric fractures require specific treatment.

The therapy of displaced supracondylar humerus fractures in children is frequently difficult. The doctor caring for these patients encounters management pitfalls often and on a consistent basis, particularly when it comes to displaced supracondylar fractures.[5,6] The therapy of displaced supracondylar humerus fractures in children is frequently difficult. The doctor caring for these patients encounters management pitfalls

often and on a consistent basis, particularly when it comes to displaced supracondylar fractures. If the fracture is not correctly managed, it may result in a number of problems, including malunion, volkmann's ischemic contracture, neurovascular damage, skin slough, and myositis ossificans.[7]

The recommended treatment for displaced type (Modified Gartland Type II, Gartland Type III, and Type IV) supracondylar humerus fractures is closed reduction and percutaneous Kirschner wire (pin) fixation.[8] They frequently employ two crossing pins, one inserted laterally and the other medially. Few people utilize no medial pins and two or three lateral pins. This study compares and contrasts the effectiveness of the two pinning methods for children with humeral supracondylar fractures.

### Material and Methods

The present study was done for the period of one year, in the Department of orthopedics with the association of the Department of paediatrics, in the medical college and associated hospital. The ethical committee of the institute was informed about the study and the ethical clearance certificate was obtained prior to the start of the study.

**Source of Data:** The material for the present study was been collected from paediatric patients from in-patient department admitted in Orthopaedics department matching the inclusion criteria, at a hospital. The included patients were diagnosed with the displaced supracondylar humerus fracture treated operatively with Cross VS Lateral Pinning.

All patients admitted were resuscitated in trauma care and evaluated using trauma series radiographs if found necessary and with opposite normal side radiographs. Fractures were classified clinically and using true anteroposterior and lateral radiographs of elbow with preoperative clinical examination were recorded. Patient's parents /guardian were counselled regarding advantages, disadvantages and possible complications of this procedure and a written informed consent was obtained. The included patients were divided in group A and group B. Each group consisted of 20 patients, total of 40 patients were included in study. The fracture of patients in group A was fixed with two laterals cross Kirschner wires configuration and fracture of patients in Group B was fixed with mediolateral cross Kirschner wires configuration. All the operations were performed by senior consultant orthopaedic surgeons. Technique of Kirschner wire fixation of the fracture was allocated to the patients randomly.

The inclusion and exclusion criteria followed in the study followed were as mentioned below:

**Inclusion criteria:** All displaced Supracondylar humerus fractures, Age of the patients less than 15

years, no history of any previous ipsilateral elbow injury.

**Exclusion criteria:** Patients with age more than 15 years, any association with neurovascular injuries.

**Functional classification:** Flynn's criteria was used to classify into satisfactory or unsatisfaction of the patients. Range of motion, carrying angle and presence of neurological deficits were measured and were rated as poor, fair, good and excellent on the basis of the patient's evaluation.

### Results

The fracture characteristics of groups A and B were compared in the analysis of the current study, and post-reduction radiographs that demonstrated successful randomization. A total of 40 patients who underwent surgery for displaced type III supracondylar humerus fractures were included in the research. The average age of the 40 patients in this group was found to be 10 years, with a male preponderance compared to females, and 36 patients having right side predominance and 4 having left side predominance. All of the fractures were type III Gartlands, affecting 16 patients on the right side and 24 patients on the left.

Ten patients made up group A (the lateral pinning group). 9.1 years was found to be the mean age. 16 of the patients were men and 4 were women. 18 patients had injuries from falls from height, and 2 patients had injuries from traffic accidents on the road. When right and left side fractures were compared, it was discovered that left side fractures were statistically significant. Twenty patients made up group B (the conventional pinning group). 5.9 years was the average age. Twelve patients were men and eight were women out of the total patients included. Falling from a height caused injuries in 16 patients, whereas road traffic accidents caused injuries in 4 patients. Twelve patients overall had right elbow fractures, whereas eight also had left elbow fractures. Most of the patients in the current group received primary splintage as well.

Eight patients had left elbow fractures, while 12 patients had right elbow fractures. The majority of patients in the current group also had primary splintage. In 18 cases, the displacement was posteromedial, and in 2, the fracture was posterolateral. Two patients had open reduction and pinning done, compared to 18 patients who had closed reduction and pinning. Four of the patients in this group had iatrogenic injury to their ulnar nerves. The average loss in the Baumann angle was 4.800.68. No patients experienced post-operative reduction loss. 128.3 degrees of mobility were available overall. 16 patients met the Flynn criteria for satisfaction, whereas just 4 patients did not. A superficial pin tract infection affected two patients. Only 4 individuals had modest limitations in

everyday activities, whereas 16 patients had a complete restoration to function. Both groups A and B were compared in terms of parameters given in the table below. There were no significant

differences ( $p > 0.05$ ) between groups with regard to any of these variables except 4 cases in group B had iatrogenic ulnar nerve palsy which needed pin removal which recovered subsequently.

**Table 1: Comparison between group A and B in various parameters**

Parameters comparison		Group A	Group B
Range of motion	Flexion	132	125.3
	Extension	-2	3
	Total	130	128.3
Flynn criteria	Satisfactory	16	16
	Unsatisfactory	4	4
Pin infection	Yes	4	2
	No	16	18

## Discussion

One of the most frequent injuries in children is a supracondylar fracture. The goal of treatment is to deliver a limb that is functionally acceptable and has a normal range of motion as soon as is humanly possible. An alternative used in cases of failed closed reduction, open fractures, neurovascular injuries, increased edoema, or hematoma in supracondylar humeral fractures of Gartland type III and type IV supracondylar fractures is open reduction and internal fixation.[9,10] These fractures can range in severity from mild to severe, complete or incomplete. The examination and management of these fractures commonly follow the Gartland categorization system. It divides them into three categories: type 1—no displacement or mild displacement; type 2—displacement with intact posterior cortex; and type 3—complete displacement without contact between fragments. Furthermore, the modified Gartland classification, which adds a fourth type complete multidirectional displacement of fragments with periosteal disruption—is widely applied.[11]

More severe kinds, such as those requiring closed reduction and percutaneous pinning (CRPP), nearly usually require surgical therapy. For type 2 and type 3 fractures, retrograde pinning is done with two and three pins, respectively.[12]

Although the current gold standard for treating displaced supracondylar fractures of the humerus in children is closed reduction with percutaneous pinning stabilisation, there is still debate over the pin shape of K-wires based on fracture stability biomechanics and ulnar nerve safety. This series looked at a modified cross wiring approach that was only used from the lateral side. According to the results of the current study utilising Flynn's score, 80% of the patients had satisfactory results, whereas 4% had unsatisfactory results (loss of range of motion).[13,14]

There are two ways to use the K-wire fixation: crossing and parallel. We used the crossed approach. Which approach is the best is not

definitively proven. The crossover approach uses a medial and lateral wire, whereas the parallel method uses two lateral wires. While the parallel method has a lower risk of iatrogenic nerve injury, the crossover method offers higher stability. In this investigation, iatrogenic ulnar nerve injury was discovered post-operatively in five patients (6.02%), but hand function was satisfactory at the last follow-up. This sort of surgery frequently results in ulnar nerve damage, which has also been shown in earlier research. Studies on stability had shown that crossing pins provide the highest stability. Bobby Dezfuli et al.[15] The most stable configuration, according to their research, was the crossed-wire layout, which was positioned from the medial and lateral condyles. Although they encouraged the use of crossed pins, they also indicated that two lateral parallel pins might be an inferior but workable alternative in cases of considerable swelling.

## Conclusion

Closed reduction and percutaneous criss-cross K-wire fixation are effective treatments for displaced supracondylar humeral fractures. With the exception of ulnar nerve damage, neither group experienced any serious complications. The functional outcome appears to be the same in both groups. Although technically difficult, it is essential to perform this method with fluoroscopy assistance.

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