

# Effect of Supination vs Pronation in Non-operative Treatment of Pediatric Supracondylar Fracture Humerus

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## Effect of Supination vs Pronation in Non-operative Treatment of Pediatric Supracondylar Fracture Humerus

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### **ABSTRACT**

**Objective:** To compare modes of the forearm positions (supination and pronation) in terms of elbow deformity after closed reduction and casting of supracondylar fracture humerus.

**Methodology:** Prospective study was conducted at orthopedic surgery department of Nishtar Hospital Multan from January 2023 to February 2024. One hundred patients were included in study, in 45 patients elbow joint was stabilized in pronation position after reduction and in 55 patients in supination position respectively. Supracondylar fracture was managed with closed reduction and immobilization procedure. Outcomes were assessed through clinical and radiographic examination. Follow up was done till 8 months. SPSS version 23 was used for data analysis and p value  $\leq 0.05$  was considered as significant.

**Results:** In pronation, the type of fracture (I & III) was noted as n=32 (71.1%) and n=13 (28.9%), respectively. While in supination, type of fracture (I & III) was noted as n=40 (72.7%) and n=15 (27.3%), respectively.

**Conclusion:** There is a definite difference between two groups of management supination and pronation in the closed treatment of supracondylar humerus fracture regarding elbow malunion deformity.

**Keywords:** Pronation, Fractures, Supracondylar Humerus Fracture, Immobilization, Supination.

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## 1. INTRODUCTION

Supracondylar fracture of the humerus is the most common elbow injury in pediatrics that requires reduction and immobilization properly especially on first decade of life (1). These fractures may be of flexion type or extension type. About 98% of cases are extension type (2). In extension types of fractures mostly posterior displacement with lateral tilt was found. Gaertland classification was used to classify supracondylar humeral fractures (3). According to this classification fracture without displacement were categorized Gaertland type I fractures, partial or minimal displacement with intact posterior periosteum were categorized as Gaertland type II and complete displacement was labelled as type III fracture (4,5).

Multiple treatment options are available for its management like percutaneous pinning, closed reduction and cast fixation and open reduction and internal fixation. Supracondylar fracture managed with closed reduction and casting has good results in cases that were treated within early hours of incident (6). Very sudden action with these cases is closed reduction and immobilization and internal fixation may require in some cases. Most important thing is position of forearm either supination or pronation after recover (7). The best choice is dependent on lateral displacement of distal humeral fracture. Periosteum changes are also described in stability (8).

Furthermore, it was observed that if elbow can flex at 90° and angle of fracture less than 40° without involvement of radial artery fracture should be considered stable (9,10). The study findings can contribute to improved functional outcomes for pediatric patients with supracondylar fractures. By using the more effective immobilization technique, clinicians can help promote better range of motion, strength, and overall functional recovery in affected children.

## 2. METHODOLOGY

A prospective study was conducted at the orthopedic surgery department of Nishtar Hospital Multan from January 2023 to February 2024. Non probability consecutive sampling technique was used. The study included cases of supracondylar fractures of the humerus in pediatric patients that were treated with closed reduction and immobilization. Fractures that require surgery for vascular repair, floating elbow, multiple fracture re-displacement during cast immobilization were excluded from the study.

Closed reduction was performed in Operation Theater under anesthesia. An assistant holds the upper arm in supine position and forearm stabilized with longitudinal traction. Manipulation was done then with reduction of postero

medial displacement. Reduction was controlled with C-arm fluoroscopy. Radial pulse was assessed to mark the elbow flexing. Patients in group A were than managed with closed reduction and plaster cast in supination and group B were managed with closed reduction and plaster cast in pronation. Follow up was done till three weeks and radiography was used for assessment. In case of unacceptable displacement that requires surgical management, patients were observed for ten days. Folding fractures like presence of callus tissue and absence of pain confirm the union. At last, active motion during follow-up was permitted, the plaster splint was removed, and physiotherapy commenced. Radiographic and clinical evaluations were conducted to assess the appearance of the elbow.

SPSS version 23 was used for data analysis. Mean and standard deviation were calculated for numerical data like age. Frequency and percentages were calculated for categorical data like gender, affected side and type of fracture. Tests of significant were applied to see association among variables. P value less than or equal to 0.05 was considered as significant.

### 3. RESULTS

One hundred patients were included in this study. There was n=48 (48%) boys and n=52 (52%) girls. The mean age of the patients was  $5.69 \pm 2.31$  years. There was n=45 (45%) patients with pronation and n=55 (55%) patients with supination. In pronation, there were n=22 (48.9%) boys and n=23 (51.1%) girls with mean age  $5.96 \pm 2.04$  years. The right side was affected in n=27 (60%) patients and left side was affected in n=18 (40%) patients with pronation. While, in supination, there were n=26 (47.3%) boys and n=29 (52.7%) girls with mean age  $5.47 \pm 2.51$  years. The right side was affected in n=23 (41.8%) patients and left side was affected in n=32 (58.2%) patients with supination. The difference was not statistically significant. (Table 1).

**Table 1: Distribution of the Patients according to Position of Forearm Supination and Pronation of Casting**

Variable	Pronation n= (%)	Supination n= (%)	P-value
Age (years)	5.96±2.04	5.47±2.51	0.300
Gender			
Boys	n=22 (48.9%)	n=26 (47.3%)	0.872
Girls	n=23 (51.1%)	n=29 (52.7%)	
Side affected			
Right	n=27 (60%)	n=23 (41.8%)	0.070
Left	n=18 (40%)	n=32 (58.2%)	

In pronation, the type of fracture (I & III) was noted as n=32 (71.1%) and n=13 (28.9%), respectively. While in supination, type of fracture (I & III) was noted as n=40 (72.7%) and n=15 (27.3%), respectively. The difference was statistically insignificant, (p=0.858). The distribution of the patients according to cubitusvarus and cubitusvalgus was shown in table 2. The difference was statistically significant, (p=0.214) and (p=0.875), respectively. (Table 2).

**Table 2: Types of Fracture in Patients**

Variable	Pronation n= (%)	Supination n= (%)	P-value
Type of fracture			
II	n=32 (71.1%)	n=40 (72.7%)	0.858
III	n=13 (28.9%)	n=15 (27.3%)	
Cubitusvarus			
Type II	2	2	0.214
Type III	4	5	
Cubitusvalgus			
Type II	1	1	0.875
Type III	2	1	

#### 4. DISCUSSION

Biomechanics of supracondylar fracture shows that posteromedial displacement of distal humerus is most common. In case of posteromedial displacement, periosteum acts like hinge that preserve the reduction. Such types of fractures can be treated with closed reduction method (11). In closed fractures the most common deformity is cubitus varus that occurred about 58% such closed fracture (12).

In a study conducted by Reynold's et al. (13) reported cubitus varus deformity in 14% of patients which is a smaller incidence ratio. Another study was conducted by Prone et al. (14) in 1988 and reported this incidence in 7.9% of patients out of 101 patients presented with closed fractures of supracondylar humerus and managed with splint plaster.

In 2003 Shoib et al. (15) conducted a study on management of supracondylar humerus fracture and reported satisfactory results in patients managed with Gaertland type II fracture and plaster splint was applied but Gaertland type III was not shows satisfactory results when managed with plaster splint.

Normal appearance of elbow may affect due to malunion of cubitus varus at its normal functioning because of safety of ulnar nerve. A study was conducted by Nejad et al. (16) on supination and pronation positions in

supracondylar fracture of humerus and reported no significant difference in supination and pronation positions in elbow and malunion deformity but cubitus varus malunion was observed in both groups when managed type III patients.

Another similar study was conducted by Babar IU et al. (17) in Gaertland's III fractures and reported that closed reduction with extension and supination position immobilization is the treatment of choice for both vascular safety and reduction positions. Julfiqar M et al. (18) conducted a study on this topic and reported that closed reduction and percutaneous fixation is the treatment of choice for management of supracondylar fracture of humerus in children. Union was observed in 100% of patients.

Srivastava et al. (19) conducted a study focused on the management of supracondylar fractures of the humerus, wherein they observed various complications among patients. Specifically, they noted that 145 patients developed pin tract infections, while 2% of patients experienced nerve injuries. However, despite these complications, the study highlighted an excellent outcome in 81% of patients who underwent open reduction and pin fixation for their fractures.

Similarly, Weiland et al. (20) also conducted a study on supracondylar fractures of the humerus. Contrary to Srivastava's findings, they reported that there were no specific infections observed in any of the patients included in their study. Furthermore, their research indicated that employing closed reduction and fixation methods for managing supracondylar fractures led to a reduction in hospitalization time for the patients involved.

## 5. LIMITATIONS

The severity of supracondylar fractures can vary widely, and this variability may not be adequately accounted for in the study. Different degrees of fracture displacement or associated injuries could impact treatment outcomes.

## 6. CONCLUSION

In comparing the management of supination and pronation in closed treatment for supracondylar humerus fractures, a clear difference was evident in the development of elbow malunion deformity. Despite both groups experiencing cubitus valgus and varus in unstable type III fractures, it is recommended to address this complication through operative fixation with open reduction instead of relying solely on closed reduction and forearm immobilization.

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