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**Dr. Anvesh Gattu**  
Assistant Professor,  
Department of Orthopedics,  
Narayana Medical College,  
Nellore, Andhra Pradesh, India

**Dr. BLS Kumar Babu**  
Associate Professor,  
Department of Orthopedics,  
Narayana Medical College,  
Nellore, Andhra Pradesh, India

## Percutaneous pinning in displaced supracondylar fracture of humerus in children

**Dr. Anvesh Gattu and Dr. BLS Kumar Babu**

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### Abstract

**Introduction:** Supracondylar fracture is the fracture involving the lower end of the humerus through the coronoid and olecranon fossae, or just above the fossae or through the metaphysis of the humerus. These fractures can be divided into extension type and flexion type of fracture. The extension type of fractures constitutes about 98% and flexion type is rare constituting 2% of supracondylar fractures.

**Methodology:** All the patients attending emergency department and outpatient department were examined according to the protocol. Any associated features were noted. All the patients were subjected for antero posterior and lateral views of elbow X ray. The fractures were then classified according to Gartland classification

**Results:** About 96.7% of the children had excellent results and 3.3% had unsatisfactory results.

**Conclusion:** The supracondylar fractures were common in 10 – 12 years age group and male children were affected more than females. The rates of complication were low in this study and ranges of movements were almost normal in majority of the patients.

**Keywords:** Supracondylar Fracture, Percutaneous Pinning, Humerus

### Introduction

Supracondylar fracture of the humerus in children is one of the most common fractures seen in orthopaedic outpatient department accounting for 50% to 70% of all elbow fracture especially in first decade of life <sup>[1, 2]</sup>.

Supracondylar fracture is the fracture involving the lower end of the humerus through the coronoid and olecranon fossae, or just above the fossae or through the metaphysis of the humerus. These fractures can be divided into extension type and flexion type of fracture. The extension type of fractures constitutes about 98% and flexion type is rare constituting 2% of supracondylar fractures <sup>[2]</sup>. Majority of supracondylar fractures are often extension type of fractures with posterior displacement along with medial or lateral tilt. Gartland had classified this type of fractures into three different types of category including little or no displacement, partial or posterior periosteum intact and total displacement <sup>[3]</sup>. The supracondylar fractures can be classified as simple, compound and complicated fractures. The peak age of occurrence of supracondylar fractures is between 5 and 7 years. The boys have higher incidence of this fracture than girls. The treatment of displaced type of supracondylar fractures is difficult than undisplaced fractures <sup>[4, 5]</sup>.

The supracondylar fracture if not properly treated known to cause high rate of complications. This type of fracture inherently has high rates of malunion, nerve injury, compartment syndrome, myositis ossificans and vascular complications. In general fractures in children are treated conservatively. Surgical treatment is reserved for some physeal injuries, fractures associated with neurovascular compromise, open fractures and certain special circumstances like fractures around hip. The management of supracondylar fractures of humerus has evolved from a purely conservative approach to a more aggressive approach in recent years. Supracondylar fractures need a precise treatment in order to obtain a satisfactory result because of low bone remodeling associated with these injuries. It is important to use a systematic procedure for acceptable outcome <sup>[5]</sup>.

There are various modalities of treatment options available for treatment of supracondylar fractures including closed reduction and casting, skin traction, percutaneous pinning and open

### Correspondence

**Dr. BLS Kumar Babu**  
Associate Professor,  
Department of Orthopedics,  
Narayana Medical College,  
Nellore, Andhra Pradesh, India

reduction and internal fixation. Closed reduction and casting is mainly helpful in displaced supracondylar type of fractures and has been used with good results if it is performed within early hours of injury [6]. The main disadvantage of this technique is loss of reduction and necessity of repeated manipulation and it is likely to result in malunion producing varus or valgus deformity of elbow and elbow stiffness [2].

Skin or skeletal traction was another method used to treat supracondylar fractures for many years. It is also a safe and reliable method of reduction of supracondylar fractures. But the main disadvantage of this technique is, it requires long stay in the hospital [7]. Open reduction and internal fixation has been reserved for specific indications especially for a open fracture or a fracture requiring vascular exploration, or an irreducible fracture [5].

Recent literature has demonstrated good functional results with closed reduction and percutaneous pin fixation by using Kirschner ('K') wires. It is the most commonly accepted treatment of displaced supracondylar fracture of the humerus in children. The percutaneous fixation also has advantage of stable fixation of the fracture fragments, have decreased risk of circulatory compromise in the form of restoration of the radial pulse in 90% of the cases and it is simple and cost effective approach. It also decreases the length of hospital stay compared to traction [2, 8]. Many supracondylar fractures are unstable after reduction except in the acutely flexed position. If considerable swelling is accompanied with the fracture, the acutely flexed position compromises the circulation and predispose to volkmann's ischemic contracture [8]. The immobilization is safer, right angle position will often allow the fragments to slip producing various deformities.

Hence, this study was taken up with the aim of evaluating the results of percutaneous pinning in displaced supracondylar fracture of humerus in children.

**Methodology**

A cross sectional observational study was conducted in the Department of Orthopedics in order evaluate the importance of percutaneous pinning in treatment of unstable or irreducible Gartland type II and type III supracondylar humeral fractures. A total 30 children with Gartland type II and type III fractures were selected as study subjects. An institutional ethical committee approval was taken before the study was started. An informed, bilingual, written consent was obtained from the Children and their guardians before they were included as study subjects. The inclusion and

exclusion criteria were as follows,

**Inclusion Criteria**

1. Children of both sexes with supracondylar fracture.
2. Fresh cases of closed supracondylar fractures of Gartland type II and type III
3. Children aged less than 15 yrs.

**Exclusion Criteria**

1. Open supracondylar fractures
2. Undisplaced fractures.
3. Compound fractures.
4. Comminuted fractures.
5. Those who had previous attempt of manipulations

All the patients attending emergency department and outpatient department were examined according to the protocol. Any associated features were noted. All the patients were subjected for antero posterior and lateral views of elbow X ray. The fractures were then classified according to Gartland classification as follows,

- Type I Undisplaced fractures
- Type II Displaced (with intact posterior cortex)
- Type III Displaced (no cortical contact)

- a. Posteromedial
- b. Posterolateral

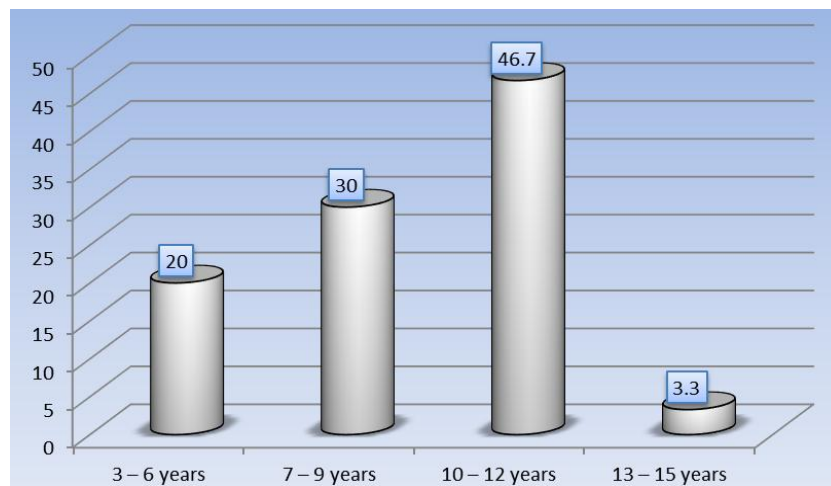
All the patients undergoing surgery were subjected for detailed diagnostic work up including Hb%, WBC, TC, DC, ESR, RBS, Blood Urea, Serum creatinine, HIV-I & II, HbSAg were conducted. Closed reduction and percutaneous 'K' wire fixation was conducted in all patients within 3 days of initial trauma.

**Result**

A cross sectional study was undertaken to evaluate the effectiveness of K wires in treatment of supracondylar fractures. The results are as follows,

**Table 1:** Distribution of the study group according to age

Age group	Frequency	Percent
3 – 6 years	6	20.0
7 – 9 years	9	30.0
10 – 12 years	14	46.7
13 – 15 years	1	3.3
Total	30	100

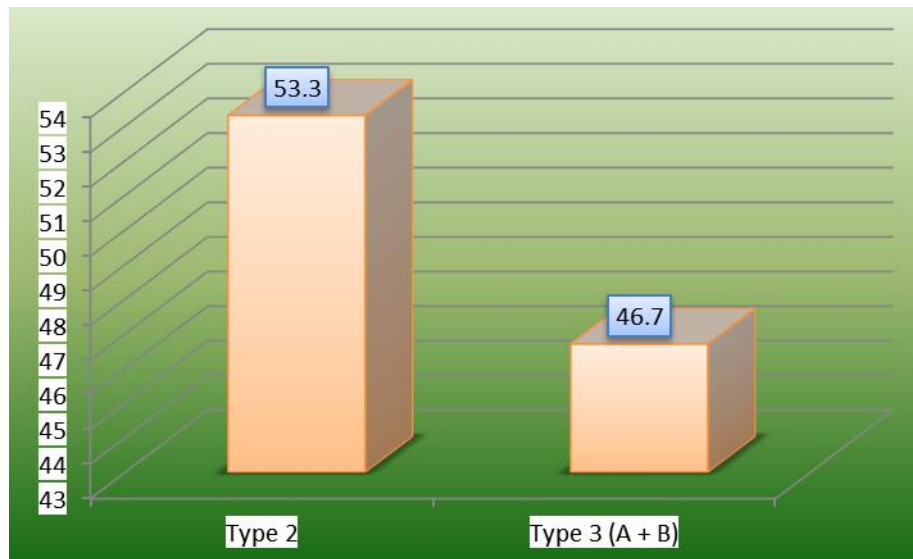


**Chart 1:** Distribution of the study group according to age

Table 1 and Chart 1 shows the distribution of the study group according to age group. The mean age of children in this study is 8.9 ( $\pm$  2.5) years. About 46.7% of the study group belonged to 10 – 12 years, 30% of the children belonged to 7 – 9 years, 20% belonged to 3 – 6 years and 3.3% belonged to 13 – 15 years.

**Table 2:** Distribution of the study group according to Gartland classification

Gartland type of fracture	Frequency	Percent
Type 2	16	53.3
Type 3(A + B)	14	46.7
Total	30	100

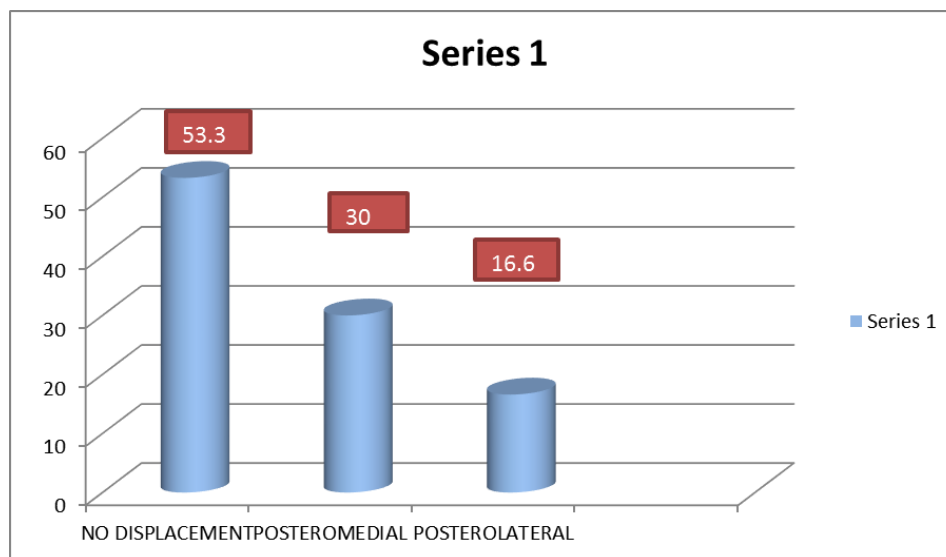


**Chart 2:** Distribution of the study group according to Gartland classification

On distribution of the children according to type of supracondylar fracture, 53.3% of the children had type 2 supracondylar fracture. About 46.7% had type 3 fractures including A and B type of fracture.

**Table 3:** Distribution of the study group according to displacement

Displacement	Frequency	Percent
No displacement	16	53.3
Postero lateral	5	16.6
Postero medial	9	30
Total	30	100

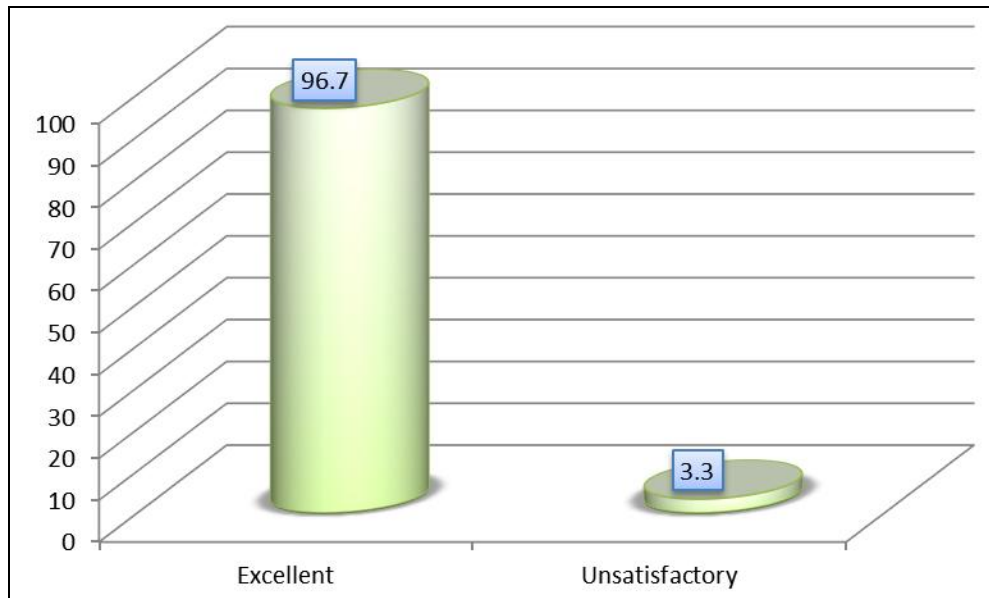


**Chart 3:** Distribution of the study group according to displacement

Out of 46.7% of the children who had type 3 fracture, 30% had postero medial (type III A) and 16.6% had postero lateral (type III B) fractures.

**Table 4:** Distribution of the study group according to Results

Result	Frequency	Percent
Excellent	29	96.7
Unsatisfactory	2	3.3
Total	30	100



**Chart 4:** Distribution of the study group according to Results

Table 4 and chart 4 shows the results of percutaneous pinning in the study. About 96.7% of the children had excellent results and 3.3% had unsatisfactory results.

#### Discussion

Supracondylar fracture mainly affects children in first decade of life. The mean age of children in this study is 8.9 years. The mean age of children from Saudi Arabia was 8.1 years similar to this study<sup>[9]</sup>. About 46.7% of the study group belonged to 10 – 12 years in this study. Fowles *et al* have found that the mean age affected was 5 – 10 years<sup>[10]</sup> The average found in Fransworth *et al* was 5.9 years<sup>[11]</sup> In a study by Reising *et al*<sup>[12]</sup>, the mean age of the patients affected was 6.6 years. Supracondylar humerus fractures are frequent injury in childhood with an age peak between 4 to 9 years<sup>[13]</sup>. In another study, the average age patients who were fixed with the medial lateral cross pin was 7.5 years and those who were fixed with the lateral two parallel pins was 7.6 years<sup>[14]</sup>. In this study, 53.3% of the children had type II supracondylar fracture and 46.7% had type 3 fractures. Among them, 30% had postero medial (type III A) and 16.6% had postero lateral (type III B) fractures. In a study by Mostafavi *et al* have shown that 81% had posteromedial displacement and 19% had posterolateral displacement<sup>[4]</sup>. Aronson had reported that 75% of the fractures were displaced posteromedially and 25% had posterolateral displacement<sup>[15]</sup>. In a study by Khan *et al*, 18 of 60 cases had Gartland type II and 42 had Type III fractures in contrary to the results of this study. The posteromedial type of fracture was more common than posterolateral type of fracture<sup>[9]</sup>. A study by Tabaka *et al* have observed four Gartland Type II and 18 Gartland Type III supracondylar fracture of the humerus. Type III fractures may present problems in their management by plaster immobilization. The chance of re displacement is more in type III fractures causing loss of reduction and increased chances of complications<sup>[16]</sup>.

The results of percutaneous pinning were excellent in 96.7% of the children and 3.3% had unsatisfactory results in this study. In a study by Khan *et al*, 88.88% had excellent results, 2 cases had excellent results, 4.44% had good results, 2% had fair results and 4.44% had poor results<sup>[9]</sup>. A study by Tabaka *et al* had shown excellent result in 21 out of 22 patients and fair result in one patient after a follow up of 38.6 months.<sup>[17]</sup> In

another study by El – Adl *et al*, 85.7% of the patients had excellent results 11.4% had good results and 2.95 had fair results. About 8.6% of the children had cosmetically unsatisfactory results<sup>[18]</sup> In another study by Anwar *et al*, 72% of the patients had shown excellent results, 28% had shown good results<sup>[19]</sup>.

#### Conclusion

- This study has shown that majority of the patients achieved excellent results by the procedure.
- This procedure reduces the length of hospital stay.

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