

## Study of Outcome of Open Reduction with Triceps Sparing Method in Paediatric Supracondylar Humerus Fractures

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**Abstract:** Supracondylar fracture of humerus in children is the commonest paediatric skeletal injury around the elbow. Peak incidence of this fracture occurs in age group of 6 – 9 years. Many treatment modalities are available in the management of Supracondylar fracture of humerus. The aim of this study is to evaluate the of short term results of open reduction using the triceps-sparing approach and Kirschner wire fixation after failed close reduction in Gartland Type III Supracondylar fracture of humerus in children. 30 patients, between age group 1-16 years were included in the study. According to FLYNN'S criteria, results were analysed. Out of 30 patients 86.66% patients achieved good to excellent results and 13.33% showed fair and poor result. 66.66% of patients had excellent results and 20% of cases had good results. The total satisfactory results were 86.66%, 10% of cases had fair results and 3.33% of cases had poor results. The total unsatisfactory results were 13.3%. Open reduction and k-wire fixation without cutting triceps is a choice of treatment for displaced supracondylar fracture of humerus in children because of decreased risk of nerve injuries, vascular injuries and post operative stiffness.

**Keywords:** Supracondylar, Gartland type III, Triceps-sparing, Flynn criteria

### I. Introduction

Supracondylar fracture of humerus in children is the commonest paediatric skeletal injury around the elbow<sup>1</sup>. Peak incidence of this fracture occurs in age group of 6 – 9 years due to various causes mainly ligamentous laxity, active remodelling and anatomical structure of humerus tube to flat transformation at lower end of humerus<sup>2,3</sup>. Many treatment modalities are available in the management of Supracondylar fracture of humerus like

1. Closed reduction and immobilisation in above elbow cast / slab
2. Over head olecranon wing nut traction
3. Closed reduction and percutaneous pinning under image intensifier control
4. Open reduction and pinning ( lateral pin, cross pinning constructs)
5. Lateral external fixator<sup>5</sup>
6. Straight arm skeletal traction<sup>6</sup>.

Supracondylar fracture of humerus is known for complications because of the inherent fracture instability, close vicinity of brachial artery and three major nerves of upper extremity and poor radiographs and poor interpretation of reduction and modality of maintenance of reduction and lastly patient compliance to treatment. Supracondylar fracture of humerus is one of the few fractures which when treated well may not bring reputation to the surgeon but which when treated improperly will definitely bring discredit to well reputed surgeon.

### Aims and Objectives

The aim of this study is to evaluate the of short term results of open reduction using the triceps-sparing approach and Kirschner wire fixation after failed close reduction in Gartland Type III Supracondylar fracture of humerus in children.

### Materials And Methods

Sample size:30

### Inclusion Criteria:

- 1) Age of patient 1 to 16 years
- 2) supra condylar fracture humerus not reduced by closed method (type 3)

### Exclusion Criteria

- 1) Age of patient above 16 years.

- 2) Patients with intercondylar component
- 3) Patients not seeking treatment modality according to our protocol
- 4) Patients presenting with infection at fracture site
- 5) A fracture associated with vascular damage/neurological damage

#### **Evaluation of patients were done in terms of**

Side of limb injured,time since injury,close or open fracture,puckering of skin at elbow,amount of swelling at elbow,presence or absence of radial pulse,nail bed circulation and signs of compartment syndrome,associated neural injuries—radial, median and ulnar, associated musculoskeletal injuries.

**Radiologically evaluation consisted of** --- anteroposterior and lateral films initially And after manipulation with or without pinning, Jones view is evaluated. In anteroposterior films –Baumanns angle was measured In lateral films – anterior humeral line , crescent sign and fish tail sign were noted. In Jones view assessment of the coronal alignment of distal fragment was done.

For classification we used Gartland classification with Wilkins modification EXTENSION TYPE and FLEXION TYPES depending upon the sagittal tilt of distal fragment .Both types are further classified into

**TYPE I—UNDISPLACED**

**TYPE II – DISPLACED WITH INTACT POSTERIOR CORTEX / ANTERIOR CORTEX**

**TYPE III – DISPLACED WITH NO BONE CONTACT**

**TYPE III** is further classified into two types (Wilkins modification) depending upon the displacement type

a)posteromedial

b)posterolateral

#### **The Management Protocol Was**

For type III (completely displaced )--- not reduced by closed methods,. --- open reduction by posterior approach and fixation with K-wire . After fixation elbow is supported with above elbow pop slab or cuff and collar.Indications for open reduction and K – wire fixation were

- 1)2 to 3 attempts of failed closed reduction manoeuvring
- 2)An open fracture

#### **Open Reduction Technique**

We did posterior approach(triceps reflecting) to lower end humerus for the open reduction of fracture .. After open reduction of the fracture, pins are then placed either medially and laterally or two pins are placed laterally, to provide stable fixation. After open reduction, pins may be left in place slightly longer than after closed reduction. Good callus should be observed at the fracture before pin removal, generally 3 to 4 weeks after injury.

Results were graded according to the flynn’s criteria as excellent, good, fair and poor results

#### **Excellent:**

- Loss of movement 0-5<sup>0</sup> (Functional)
- Loss of carrying angle 0-5<sup>0</sup> (Cosmetic)

#### **Good**

- Loss of movement 5-10<sup>0</sup> (Functional)
- Loss of carrying angle 5-10<sup>0</sup> (Cosmetic)

#### **Fair**

- Loss of movement 10-15<sup>0</sup> (Functional)
- Loss of carrying angle 10-15<sup>0</sup> (Cosmetic)

#### **Poor**

- Loss of movement more than 15<sup>0</sup> (Functional)
- Loss of carrying angle more than 15<sup>0</sup> (Cosmetic)

#### **Results**

In present series of 30 patients , Most of the patients are in the age group of 5—8 years(46.67%) in our study. Incidence of supracondylar fracture of humerus was more in males (63.33%) when compared to females (36.67%) in our study. In our study involvement of left side (66.67%) is more than right side.We fixed 30supracondylar fractures of humerus patients. Our preferred construct was cross pinning. We did 1 lateral and 1 medial pinning in 20cases , and 2 lateral pins in 3 cases and 2 lateral pins and 1 medial pin construct in 1 cases. Post operatively,one patient had pin tract infection,2 patients had developed cubitus varus deformity

and one patient had restriction of movements. In 86.67 % cases , change in carrying angle was less than 10 degrees.

**Table 1:**

Result	according to loss of range of motion		According to loss of carrying angle		Average percentage
	No. of patient	%	No. of patient	Percentage	
Excellent	20	66.66%	20	66.66%	66.66%
Good	6	20%	6	20%	20%
Fair	3	10%	3	10%	10%
Poor	1	3.33%	1	3.33%	3.33%

According to FLYNN'S criteria<sup>7</sup> results of our study are analysed. In our study, out of 30 patients 86.66% patients were good to excellent and 13.33% showed fair and poor result. 66.66% of patients had excellent results and 20% of cases had good results. The total satisfactory results were 86.66%, 10% of cases had fair results and 3.33% of cases had poor results. The total unsatisfactory results were 13.3%. Poor and fair results were because of initially they had prior treatment before admission in the form of massage and manipulation and secondarily due to difficulty in reduction and fixation of the fragments in unsatisfactory position.

## II. Discussion

### Age Distribution

Musa et al<sup>10</sup> conducted a prospective study based on 30 cases with type III Gartland fracture managed by crossed percutaneous pinning over a period of two years. Age group range was 2 to 13 years with a mean age of 7.06 years. Charles A Rockwood observed that the peak incidence of supracondylar fracture of humerus in children is in the later part of first decade of life.

In the present study, the average age is 7 years ( range 2 -- 15 years ) and the most common age group affected was between 5—8 years (46.67%).

### Sex Distribution

Pirone A M et al in their study of 230 patients with supracondylar fracture of humerus showed that boys (119) were affected more than girls

Robert D Ambrosia in his series found an incidence of supracondylar fracture of humerus in male child is 63% and female child is 37%.

In our study, the incidence of supracondylar fracture of humerus is 63.33% in male and 36.67 % in females.

### Side Involvement

Robert D Ambrosia found involvement of left elbow was 64 % and involvement of right side was 36 % among his cases of supracondylar fracture of humerus in children. Ahamad et al in their study of supracondylar fracture of humerus in children showed the predominance of left side involvement. In the present study left side was involved in 67% and right side 33 % cases. incidence of side involvement in the present study is consistent with the above series.

### Fracture Type Incidence ( Gartland Classification With Wilkins Modification )

Pirone A H et al (1988) studied 230 cases of displaced supracondylar fracture of humerus and observed that 137 (62%) cases were type III fractures and 83 (36%) were type II .in type III fractures 94 were with posteromedial displacement ,22 with posterolateral displacement and 21 with direct posterior displacement. Mehlman et al during their study of operative treatment of supracondylar fracture of humerus in children found that according to Gartland's classification ,77.4% were type III fractures and 18.3% were type II fractures On comparison , in the present study Of 30 patients , 4 (13.33%) were type I , 8(26.66%) were type II and 18(60%) were type III fractures.

### Complications Pin Tract Infection

Pirone A H et al (1988) studied 230 cases of displaced supracondylar fracture of humerus and observed that out of 78 cases treated with closed reduction and percutaneous pinning 2 cases had pin tract infection Cramer K E in his retrospective review of 29 children with supracondylar fracture of humerus in children treated with closed reduction and percutaneous pinning and open reduction and percutaneous pinning 1 patient in closed reduction and percutaneous pinning group out of 15 cases showed superficial pin tract infection

Lejman T et al showed no case of pin tract infection in 20 cases of supracondylar fracture of humerus cases treated with closed reduction and percutaneous pinning. In our study 1 patient showed evidence of pin tract infection in 30 cases treated with open reduction and pinning.

#### **Cubitus Varus**

Topping et al showed incidence of cubitus varus in one patient(4.3%) out of 43 cases treated with closed reduction and percutaneous pinning.

Kennedy observed 2 cases with cubitus varus deformity among 32 cases of displaced supracondylar fracture of humerus in children.

In the present study, two patients (6.67%) developed cubitus varus. This deformity is seen with one patient in open reduction and percutaneous pinning group.

#### **Proximal Migration Of Wire**

Pirone A M et al observed migration of one lateral pin out of 96 cases treated with closed reduction and percutaneous pinning.

In our study, in no case we saw this complication because in all pinning cases we bent k-wires outside the skin after application.

### **III. Results**

In our study, results are evaluated according to Flynn's criteria which is based on change in carrying angle and loss of movement after treatment.

Franke et al in study of 106 patients with displaced supracondylar fracture of humerus treated with closed reduction and percutaneous pinning showed 85.7% good to excellent results with 10.7% satisfactory results and 4.6% with unsatisfactory results.

Ababneh et al in his retrospective study of 135 patients with displaced supracondylar fracture of humerus treated with three different methods, results of closed reduction and percutaneous pinning were superior, with excellent and good results in 87% patients and poor results in 8% patients.

Bopana and Rakesh sharma et al studied 54 cases of supracondylar fracture of humerus and found that 80% good results and 20% unsatisfactory results in open reduction and internal fixation group compared to 44% unsatisfactory results in closed reduction and percutaneous pinning group.

In our study, out of 30 patients 86.66% patients were good to excellent and 13.33% showed fair and poor results.

### **IV. Conclusion**

Open reduction and k-wire fixation without cutting triceps is a choice of treatment for displaced supracondylar fracture of humerus in children because of decreased risk of nerve injuries, vascular injuries and post operative stiffness. Late complication like cubitus varus deformity can be avoided by open reduction and k-wire fixation, as perfect anatomical reduction can be achieved as compared to closed reduction and casting in displaced fractures.

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