

## COMPARATIVE STUDY OF SUPRACONDYLAR FRACTURE OF HUMERUS IN CHILDREN TREATED WITH CLOSED REDUCTION AND CLOSE REDUCTION WITH K –WIRE FIXATION

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### ABSTRACT

**Background:** The objective of the present study is to analyse deformity and function of displaced supracondylar fracture of humerus in children treated by closed reduction with slab application and closed reduction with percutaneous pinning. **Material and Method:** The present prospective study was conducted in the department of Orthopaedics and Traumatology Ananta institute of medical sciences and research centre, Rajsamand. In this study 34 children of age between 2 – 12 years were included having fracture supracondylar humerus. Fracture is classified according to Gartland classification and according to displacement of the distal segment(flexion on extension). On the basis of their fracture pattern fracture treated accordingly i.e by closed reduction and closed reduction with pinning and results were evaluated. GARTLAND classification: (1959) classified the supracondylar fracture of the humerus in following types-

Type I: Undisplaced fracture

Type II: Displace fracture with intact posterior cortex

Type III: Displace fracture with no cortical contact.

**Conclusion and results:** In our study we found that in Grade II and III supracondylar fracture of humerus in children closed reduction is difficult to achieve and is complicated by slippage of reduction leading to malunion deformity and vascular compromise excessive flexion is done to hold reduction. In this study we found that results of displaced supracondylar fracture of humerus presenting can be effectively best treated by closed reduction with percutaneous pinning because patients who were treated conservatively developed deformities more than closed reduction and internal fixation group.

### INTRODUCTION

Elbow fracture accounts for 7 -9% of total fracture in children, in which about 50-60% of fractures are contributed by supracondylar fracture. According to displacement of distal fragment Wilkins divided fracture into two types-

Extension type(97.7%): distal fragments displaced posteriorly.

Flexion type(2.2%): distal fragment lies anteriorly.

Common age of presentation is 5 – 8 yrs and dominated by males.

Flynn, Mathew S et al. (1974), depending upon the results on the basis of range of motion and carrying angle, devised a criteria to found out functional and cosmetic outcome, when the functional and cosmetic deformity more than 15% is considered to be poor less than 15% is satisfactory.

### Flynn Criteria

Result	Rating	Cosmetic factor (Carrying angle loss) in degree	Motion (Functional loss) indegree
Satisfactory	Excellent	0-5	0-5
	Good	5-10	5-10
	Fair	10-15	10-15
Unsatisfactory	Poor	>15	>15

In spite of the fact that this fracture is so common, management of it is difficult and raised controversies from time to time. Commonly these fractures are treated conservatively and results are not uniformly satisfactory. Controversies also exist in position of immobilization this is because majority of fractures are unstable after reduction except in acutely flexed position of elbow. If considerable swelling is present, this acutely flexed position may compromise circulation and may produce Volkmann's Ischaemic Contracture. Immobilization in safer right angle position will frequently allow fragments to slip producing varus deformity Mc Laughlin(1961) called this as "supracondylar dilemma".

To deal with these problems surgeons evolved operative means for fixation of supracondylar fracture of humerus like open reduction internal fixation and percutaneous pinning.

The present undergoing study is an effort to analyse deformity of displaced supracondylar fracture of the humerus in children treated by closed reduction with slab application and closed reduction with percutaneous pinning.

## MATERIAL AND METHOD

The present prospective study was conducted in the department of orthopaedics and traumatology Ananta institute of medical sciences and research centre, Rajsamand between October 2015 to September 2017.

After arrival of patient detailed examination from head to toe was carried out then patient's details were taken like age, sex, father's name, permanent address and full mailing address, mode of injury, time of injury, pre-hospital treatment received and time required to attend hospital etc.

Extremity was examined for any neurovascular injury for compound or closed fracture. Careful motor and sensory examination was performed. Vascular examination included determination of radial pulse, as well as warmth. Capillary refill and colour of hand.

Successful reduction is based on criteria of Gartland JJ (1959) which says partial reduction of a posteriorly displaced distal fragment is acceptable provided the angle of the distal articular surface of the humerus measures atleast, zero degree with the shaft. Rotation and medial or lateral shift is not acceptable.

## Treatment

Closed reduction was done by method of Sir John Charnley (Charnley J. 1961), percutaneous pinning was done by closed reduction and pinning from lateral and medial side(John G. Thometz, 1990).

## Technique of closed reduction

The elbow was gently extended and gripping the patient wrist and distal forearm strong longitudinal traction was

given. By this means the fragment were disengaged and any important structures incarcerated between them were released.

The surgeon, still maintained traction on patient's hand with his active or reducing hand and gripping the end of humerus in his or fixing hand to maintain counter traction. The thumb of fixing hand was applied over the olecranon.

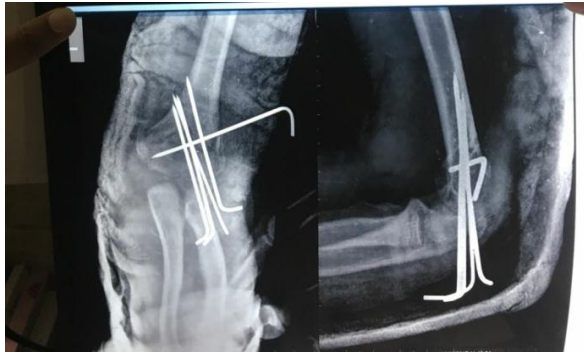
With the active hand still applying longitudinal traction to the forearm, the active hand now flexed the elbow, at the same time maintained continuous traction as the elbow flexed. The critical point in the reduction occurred when the elbow was reaching the right angle, here the fingers of the passive hand were pulling the shaft of the humerus backwards while the pull on the hand was directly drawing the fragment forwards. The reduction was held by posterior slab in as much of flexion as radial pulse tolerated.

## Technique of pinning with crossed pins

K wires are used. After closed reduction of fracture and with C – arm screen as operating table, arm was held with elbow hyperflexed to maintain reduction. Anatomic reduction was confirmed with image intensifier before lateral pins was inserted. The insertion is made so that pin will traverse lateral portion of ossified capitellum, cross the physis, proceed up the lateral column and engage in opposite medial cortex and feel for piercing opposite cortex.

The elbow was then gently extended to about 45 degree of flexion to allow a perfect AP radiograph of distal humerus to ensure anatomic alignment. The elbow was then flexed to 120 degree and externally rotated to obtain lateral image with fluoroscopy. Another K wire was passed through medial epicondyle (avoiding the ulnar groove) to engage in lateral cortex of proximal fragment. Aim of pinning was to cross both pins at midline 3 cm above the fracture. Final position was checked in both AP and lateral views K wires were bent and cut outside the skin. Sterile dressing applied and limb was kept in posterior slab in 90 degree of flexion.





## DISCUSSION

Displaced supracondylar fracture of humerus ranks high among the most challenging injuries faced by orthopaedic surgeons. Limb threatening Volkmann's ischaemia, arterial injury, nerve palsy, elbow stiffness and cubitus varus deformity continue to complicate management of these fractures. Avoidance of complication and achievement of excellent functional and cosmetic results are goal of treatment.

Average age of presentation in this series was 7.44 years, with male predominating the series (M:F = 1.4:1). Age group ranged from 1 to 12 years. Maximum number of cases occurred in 9 to 12 years of age group. Flynn and Mathew *et al.* (1974) reported mean age of presentation to be 6 years and seven months. In their series they reported 38 boys to 34 girls. Alcott, Bowden *et al.* (1977) reported average age of presentation of supracondylar humerus fracture to be 7.1 yrs with boys predominantly 44 to 52% girls. The average age reported by Alburger, Weidner *et al.* (1992) was 5 years. There were 23 boys and 15 girls in their series. As far as age presentation is concerned in this series shows similar results. Males predominated the series because boys have more outdoor activities as compared to girls.

In our study most fracture occurred due to fall during playing. Fall from tree is also a mode of trauma seen in Indian scenario as is observed in our series. Other authors have reported fall on outstretched hand to be most common cause of supracondylar humerus fracture. Abraham and co workers (1982) experimentally demonstrated that if force exerted on hyperextended elbow is transmitted to anterior aspect of the elbow through olecranon fossa. Thus not much force is required to cause injury and trivial trauma on fall an outstretched is sufficient to cause supracondylar humerus fracture.

In our series time between injury and hospital attendance was 10.35 hrs. Most of our patients reported within first 12 hrs. of injury. Maximum number of patients in our series had pre hospital treatment by sling made of local cloth. Delay between injury and hospital attendance is evident is due to the fact most of the patients come from rural areas and transportation to referral center is delayed. This is not unusual in Indian scenario to go to bone setter before going to proper treatment. Lal and Bhan (1991) did ORIF on all late presentation 11-17

days after injury. Kumar, Kiran EK *et al.* (2002) reported average delay of 34 hrs in their series. Findings in the present series correlate with above finding whereas in developed countries most of the patients attend hospital in 6 hrs.

In our series right elbow was affected in 11 cases while left elbow in 23 cases. In their series Boyd and Aronson (1992) reported involvement of left elbow in 40 cases while right in 31 cases. Cheng JC, Lam TP *et al.* (2001) reported that non dominant humerus was injured 1.5 times more common. Archibald, Robertrts *et al.* reported that 59% of fracture involved non dominant arm. Whereas in contrast Alcott, Bowden *et al.* (1977) reported fracture of right elbow in 29 patients while left elbow in 40. It is evident from this series that non-dominant side is more frequently involved. Out of 34 cases in our series 1 case was complicated by neural injury which eventually recovered after 6 months. These finding very well correlated with findings of other authors. Flynn and Matthews *et al.* in their study in 1974 found 13% neural and 18% vascular complications. Fowles and Kassab reported 7 cases of neural injury among 110 children and absent radial pulse in 8 out of 110 cases. Flexion type of fracture was not found on our study. Pin track Infection was reported in 1 case which subsequently cleared after wire removal.

## SUMMARY

A prospective study was undertaken to evaluate supracondylar humerus fracture in children by clinical outcome and deformity in closed reduction and closed reduction with percutaneous pinning. A total of 34 cases are taken for the study.

In our study boys outnumbered girls by 1.4:1 and 41.17% of cases were in 9 to 12 years of age group.

Left arm was involved in 67.65% and right arm in 32.35% cases.

Fall during playing was the most common mode of trauma (64.70%).

67.64% of our patient attended the hospital within 12 hrs of injury. 47.15% of patients in our series received prehospital treatment by sling, made of local cloth.

On presentation ulnar nerve and median nerve were involved in 2.94% cases each.

There was no case of flexion type of supracondylar fracture found in our study.

Closed reduction was done in 20.59% cases. Closed reduction and pinning was done in 79.41% cases.

Postoperatively we had 3 (11.11%) cases of ulnar nerve palsy in closed reduction percutaneous pinning group.

All patients recovered in 8 to 12 weeks after wire removal.

Post operative infection rate was 3.70% in closed reduction and pinning group and nil in closed reduction group.

Average hospital stay was 4.08 days.

Patients treated by closed reduction had 7.4 degree average loss of flexion with average loss of extension of 7.0 degree.

Results by closed reduction were satisfactory in 55.55%.

Patient treated by closed reduction and pinning had 5.25 loss of flexion and 5 loss of extension.

6 patients (17.64%) developed varus deformity and 3 cases (8.82%) developed valgus deformity.

Average varus in Gartland type III fracture is 10 degree and valgus 8 degree. In Gartland type II fracture varus is 8 degree and valgus 7 degree.

6 (66.67%) of patients out of 9 developed deformities when they were treated conservatively.

## CONCLUSION

**In grade II & III** supracondylar humerus fracture in children closed reduction is difficult to achieve and is complicated by slippage of reduction of fracture leading to malunion deformity and vascular compromise if excessive flexion is done to hold reduction.

In this study we found that results of displaced supracondylar humerus fracture presenting early can be effectively best treated by closed reduction and percutaneous pinning because the patient who were treated conservatively developed deformities more than closed reduction and internal rotation group.

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