

Original Research Article

# Prospective Observational Study of Management of Supracondylar Fracture Humerus by Various Closed Pinning Methods

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## ABSTRACT

**Introduction:** Supracondylar fracture of humerus is the most common elbow injury in children and makes up to 60% of all elbow injuries. Great diligence is required to secure an excellent result and to avoid or minimize the crippling complications, such as Volkmann's ischaemic contracture, myositis-ossification, stiffness, permanent nerve injuries and malunion.

**Materials and Methods:** A prospective study of 35 cases of displaced fracture supracondylar of humerus treated by various closed pinning modalities was done in a tertiary care center, Mumbai, between May 2011 and June 2013. A permission to conduct this study has been sought from the hospital ethics committee and written informed consent was obtained by parents. Patients with age <15years, both sex, Gartland type II,III,IV, Close fracture with or without associated with distal neurovascular compromise were included and Patients with age >15 years, Gartland type I, flexion type, open fracture and if any fracture in the ipsilateral limb were excluded.

**Results:** In this study, mean age of the patients was 7.46 years, majority were male children, non dominant side involved more often, out of 35 fracture supracondylar of humerus in children treated, 3 patients with closed reduction 2 lateral k wire, 29 with closed reduction and 2 lateral K-wire and one medial K wire and 3 patients with open reduction and Crisscross K-wire. In this study, good result was found in 85.71% patients, fair in 14.29% patients and poor in 0% patient. 100% Satisfactory result as per Mitchell and Adam's criteria.

**Conclusion:** Anatomical reduction is must, type II can be managed by closed means better to put k wire to minimize chance of loss of reduction. Results are equal in all type II,III and IV either with 2 lateral k wires/ 2 lateral and one medial k wires/ one lateral and one medial in crisscross k wires with respect to function and cosmetics.

**Keywords:** Supracondylar humerus fracture, K-wire, Closed Reduction, Medial, Lateral.

## INTRODUCTION

Supracondylar fracture of humerus is the most common elbow injury in children and makes up approximately 60% of all elbow injuries. [1] These injuries of elbow

demand respect because for their vascular damage and nerve injury they cause than any other injuries in the body. [2] There is no controversy regarding management of undisplaced and partially displaced fracture

but the treatment of a completely displaced fracture is not one but many. Others have devised blind pinning after reduction or pinning under X-ray control. Some even advocate to the extent to accept an unsatisfactory closed reduction, perform an osteotomy to correct the deformity at a later stage. In the region of elbow, however, there are often more indications for aggressive treatment, including operative management. Much attention has been paid to the problem of malunion of supracondylar fracture of humerus by obtaining an anatomical reduction as possible either by closed or open method because it is no longer acceptable to hear: 'not bad for a supracondylar fracture of humerus'.<sup>[3]</sup>

### MATERIALS AND METHODS

A prospective study of 35 cases of displaced fracture supracondylar of humerus treated by various closed pinning modalities was done in a tertiary care center, Mumbai,

between May 2011 and June 2013. A permission to conduct this study has been sought from the hospital ethics committee. Well written informed consent was obtained from parents of all the patients enrolled in the study as all were less than 18 years. Patients with age <15years, both sex, Gartland type II,III,IV, Close fracture with or without associated with distal neurovascular compromise were included and Patients with age >15 years, Gartland type I, flexion type, open fracture and if any fracture in the ipsilateral limb were excluded. All the necessary pre-operative work-up was done in the form of Radiological (Fig. 1,2 and 3) and hematological investigations. All the fractures were classified using the Gartland's classification System. Regular follow-ups were done at 6, 12 and 24weeks post-operatively. The final results were analysed using the Mitchell and Adam's criteria (Table 1).



Fig 1: Closed reduction and two lateral K wires (Pre operative and post operative X- rays)



Fig 2: Closed reduction and two Lateral and one Medial K wire (Pre operative and post operative X- rays)

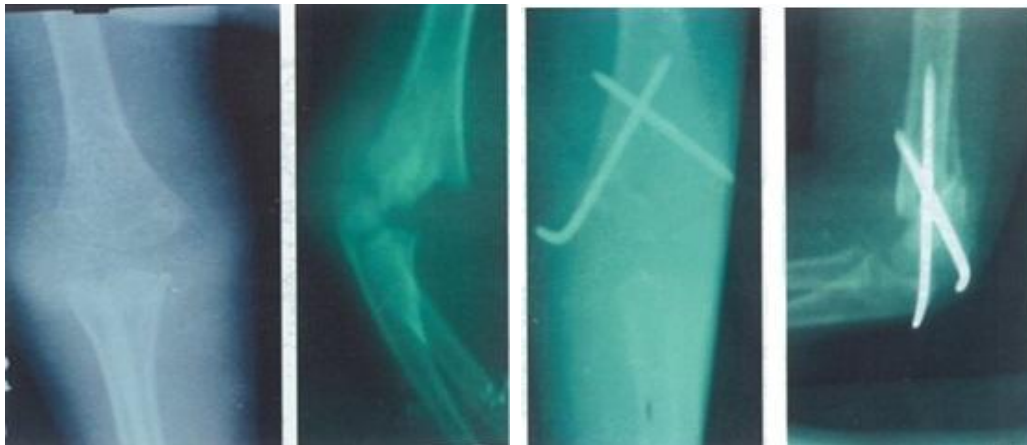


Fig 3: Closed reduction and one lateral and one Medial K wire (Pre operative and post operative X- rays)

Table1: Mitchell and Adam (1961) criteria for evaluation of the end results of supracondylar fractures.

Results	Mitchell and Adams (1961) criteria	
	Carrying Angle	Elbow Range of Motion
Good	Change in the carrying angle less than 5 degrees	Limitation of elbow motion less than 10 degrees.
Fair	Change in the carrying angle from 5 to 15 degrees	Limitation of elbow motion 10 to 20 degrees.
Poor	Change in the carrying angle more than 20 degrees	Limitation of elbow motion more than 20 degrees.

TABLE 2: Comparison of Results with Other Studies.

Various Studies	Satisfactory Result in Percentages	Unsatisfactory Result in Percentages
Fowles JV, et al <sup>[7]</sup> (1974)	87.5%	12.5%
Jeffery LN, et al <sup>[14]</sup> (1983)	76.0%	24.0%
Aronson DD, et al <sup>[8]</sup> (1987)	100%	0%
Pirone AM, et al <sup>[15]</sup> (1988)	80%	20%
Richard TD, et al <sup>[16]</sup> (2000)	80%	20%
Vankawala JD <sup>[10]</sup> (2005)	93.3%	6.6%
Present Study 2011-2013	100%	0%

### Operative Technique-

Patient was put in supine position under general anaesthesia with injured limb of the table for manipulation and for visualization under C-arm for closed reduction and pinning. Fracture managed by standard protocol with two lateral / two lateral and one medial/ one pin on each side medial and lateral sides. Post surgery immobilized in an above elbow POP slab. Post-op monitored for neurovascular status and wound/pin-tract dressing done on post-op day 2 and were discharged.

### RESULTS

In this study, mean age of the patients was 7.4 years, majority were male children, non dominant side involved more often, indirect injury was more often encountered, out of 35 displaced fracture supracondylar of humerus in children treated, 3 patients with closed reduction and two lateral k wires, 29 with closed reduction and two lateral and one medial k wire and 3

patients with closed reduction and crisscross k wire. In this study, good result was found in 85.71% patients, fair in 14.29% patients and poor in 0% patient. 100% Satisfactory result as per Mitchell and Adam's criteria. Complications noted in 9 patients, One patient developed median nerve palsy which was recovered within 12 weeks. One patient had ulnar nerve palsy which was recovered in 12 weeks. One patient developed cubitus varus and which was later managed by lateral closing wedge osteotomy. Six patients developed movement restriction, improved by physiotherapy and all patients gained full ROM at final follow up.

### DISCUSSION

Supracondylar fractures of humerus are the most common elbow injury in children and makes up approximately 60% of all elbow injuries.<sup>[1]</sup> It becomes progressively more uncommon as the child approaches adolescence, the average age group of patients being 7½ years.

These injuries of elbow demand respect because for their vascular damage and nerve injury they cause than any other injuries in the body. [2] Unfortunately it is the most difficult fracture to treat. Difficulty in treating this fracture lies in the fact that the fracture gets completed very often. Moreover, some of the complications are of nature, which threatens optimal use of the extremity either temporarily or permanently.

Thirty-Five cases of displaced fracture supracondylar humerus in children below 15 years treated by various closed pinning methods were taken in this study. The purpose of this study was to evaluate the outcome of various closed pinning modalities of displaced fracture supracondylar of humerus in children.

#### **Results are compared with other studies:**

The highest incidence of this fracture is found in age group 6–10 years in most of the studies, which was 57.14% in present study and 49.05% in Liang LK [4] study. During this age group, children are more likely to fall while playing and more likely to sustain this injury. However, Vahvanen V [5] et al study showed highest incidence in 0–5 year age group. Average age in present study is 7.46 years which is also comparable with Ippolito E, et al [6] 7.3years, and Fowles JV, et al [7] 7.2years. Male children were affected more in almost all series (74.3% in present study) which is comparable with other studies Aronson DD, et al [8] 75% and Buhl O, et al [9] 70%. In present as well as in other all studies, the left side was more commonly involved than the right side (71.4% in present study), which is also comparable with other studies, Fowles JV, et al [7] 57% and Vankawala JD [10] 63.33%. Fall on outstretched hand or indirect nature of injury was most common in present study (60.0% in present study), which is comparable with other series, Abraham E, et al [11] 88.0% and Patel JM [12] 67.2%. Type III fractures, 51.43%, were more common in our study than other studies in which Type II was more common, Buhl O, et al [9] 44% and Patel JM [12] 50%. In present study of thirty-five patients, one

(2.86%) patient had median nerve palsy which was more on comparison to other studies, Boyd HB, et al [1] 1.5% and Fowles JV, et al [7] 2.7%). No vascular complications were noted in this study, which was comparable to Aronson DD, et al [8] 0%. Ulnar nerve palsy while introducing medial K-wire was found in 1 (2.86%) patient which is a higher rate than found in Patel JM [12] study (1.7%). Loss of movements occurred in 6 (17.14%) patients in present study. Loss of flexion is found in 6 (17.14%) patients, which was comparable with Patel JM [12] study. In present study, 66.66% patients had decrease in carrying angle where as 33.33% patients had increased carrying angle. This rate is comparable with Patel JM [12] study in which 80% decreased carrying angle was present. Cubitus varus was found in 1 (2.86%) patient which was similar to Bhuyan's study. [13] Our results all the patients treated with close reduction and K-wire fixation are comparable with Bhuyan's [13] study.

In the present study, assessment of results was done at the time of final follow-up. For assessment of results Mitchell and Adam's criteria (1961) were used, good result was found in 85.71% patients, fair result was found in 14.29% patients and poor result was found in 0% patient. Thus satisfactory result was found in 100% patients. On comparison and calculating using r x c contingency table, Chi square value was 56, degree of freedom 6 and P value was <0.0001, which was found to be significant.

#### **CONCLUSIONS**

Detailed neurovascular examination on presentation is must. Anatomical reduction is must, type II can be managed by closed means better to put k wire to minimize chance of loss of reduction. Anatomical reduction can be achieved by close manipulation with exceptions like soft tissue interposition and irreducible fracture. As the incidence of malunion is high anatomical reduction must be achieved

before K-wire insertion. Multiple manipulative attempts to achieve good reduction may be dangerous. Results are equal in all type II, III and IV either with 2 lateral/ 2 lateral and one medial/ and one lateral, one medial in crisscross with respect to function and cosmetics. Results were better in non-comminuted close fracture as compare to comminuted fracture. Primary operative treatment has a definitive role in management of this fracture.

**Limitations:**

Low sample size and short term follow up are the limitations of the study.

**Conflict of interest:** Nil

**REFERENCES**

1. Boyd HB, Attenberg AR. Fractures about the elbow in children. *Arch Surg.* 1944; 49: 213.
2. Hanlon CR, Ester WL. Fractures in Children: A Statistical Analysis. *Am J Surg.* 1954; 87: 312–323.
3. Canate TS. Campbell's Operative Orthopaedics. 10<sup>th</sup> edn. Mosby; 2003.
4. Liang LK. A review of recent supracondylar fractures of the humerus in children. *Singapore Med J.* 1970 Dec; 11(4) : 264–268.
5. Vahvanen V and Aalto K. Supracondylar fracture of the humerus in children : A long-term follow-up study of 107 cases. *Acta Orthop Scand.* 1978; 49 : 225–233.
6. Ippolito E, Caterini R, Scola E. Supracondylar fracture of humerus in children. *J Bone Joint Surg Am.* 1986; 68(3) : 333–344.
7. Fowles JV, Kassab MT. Displaced supracondylar fractures of the elbow in children: a report on the fixation of extension and flexion fractures by two lateral percutaneous pins. *J Bone Joint Surg Br.* 1974; 56B : 490–500.
8. Aronson DD, Prager BI. Supracondylar fractures of humerus in children – A modified technique of closed pinning. *CORR.* 1987; 217 : 174–184.
9. Buhl O and Hellberg S. Displaced supracondylar fractures of the humerus in children. *Acta Orthop Scand.* 1982; 53 : 67–71.
10. Vankawala JD. A study of surgical management of supracondylar fractures of humerus in children with Kirschner's wire fixation. Dissertation submitted to the Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore. 2003–2006.
11. Abraham E, Gordon A, Abdul-Hadi O. Management of supracondylar fractures of humerus with condylar involvement in children. *J Pediatr Orthop.* 2005; 25(6) : 709–716.
12. Patel JM. Supracondylar fracture of humerus in children. A comparative study of non-operative and operative management of 58 cases. A dissertation submitted to Gujarat University. 1988.
13. Bhuyan BK. Close reduction and percutaneous pinning in displaced supracondylar humerus fractures in children, *J Clin Orthop and Trauma.* 2012 Dec; 3(2) : 89–93.
14. Jeffery LN, Malcom LE, Stanley MK, Paul AL Marianne D. Supracondylar fractures of humerus in children treated by closed reduction and percutaneous pinning. *CORR.* 1983; 177 : 203–209.
15. Pirone AM, Graham HR, Krajbich JI. Management of displaced extension – type supracondylar fractures of the humerus in children. *J Bone Joint Surg Am.* 1988; 70A(5) : 641–650.
16. Richard TD, John TG, Kevin P. Supracondylar humerus fracture in children. Comparison of operative treatment methods. *CORR.* 2000; 376: 49–55.

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