# PERCUTANEOUS PINNING IN DISPLACED SUPRACONDYLAR FRACTURE OF HUMERUS IN CHILDREN

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**Background:** Supracondylar fracture of humerus is the most common fracture in first decade of life. There are various treatment modalities for this fracture i.e closed reduction and casting, open reduction and internal fixation and percutaneous pinning. Study was conducted to know the outcome of Percutaneous Pinning in the management of displaced supracondylar fracture of humerus in children. **Methods**: This study was conducted at orthopedic unit of Khyber Teaching Hospital Peshawar from January 1996 to December 2000. Twenty children of 3-12 years age with displaced supracondylar fracture (Gartland type II & III) of humerus were included. Outcome measures were according to Flynn criteria i.e loss of elbow motion & carrying angle. **Results:** The children presenting were 14 male (70%) and 6 females (30%).The involved side was left in fifteen (75%) and right in five (25%) of patients. Nineteen patients (95%) had extension type & one patient (5%) had flexion type of fracture. Gartland type II were six (30%) & type III were fourteen (70%). Our result showed excellent outcome in thirteen (65 %), good outcome in four (20 %) and poor outcome in three (15 %) patients. **Conclusion:** Percutaneous pinning is safe, cost effective, time saving and provides greater skeletal stability with excellent results.

**Key Words:** Percutaneous Pinning, Supracondylar fracture, Humerus fractures.

## INTRODUCTION

Supracondylar fracture of humerus is the most common fracture in children and needs proper management. This fracture is common in the 1st decade of life[1,2] due to various causes mainly ligament laxity and anatomical structure of humerus tube (shaft) to flat transformation at the lower end of humerus. Its incidence decreases with age.[3]

Elbow fractures treatment in children remained a great challenge for surgeons since Hippocrates. Proper training is needed to adopt recent advances by young surgeons to deal with these challenges.[4]

There are two types of supracondylar fractures of humerus in children i.e. extension type (97 %) and flexion type (3 %).[5] Mechanism of injury is hyperextension, abduction or adduction of elbow during fall on dorsiflexed hand and flexed elbow.[6]

There are various treatment modalities for the management of supracondylar fracture of humerus in children i.e. closed reduction and casting, open reduction and internal fixation (ORIF) and percutaneous pinning (PCP).

Displaced supracondylar fractures should be treated with PCP in controlled environment i.e during day time when trained orthopedic surgeon, assistant, and image intensifier with technician are available. During night these facilities may not be available, so these cases should be treated on morning theatre list, because overnight delay does not harm the results.[7] PCP can be done in emergency theatre under image intensifier preferably within first 8-12 hours of injury.[8] Closed reduction and casting for displaced supracondylar fractures in children may lead to loss of reduction and cubitus varus deformity while in case of percutaneous pinning these complications are very low.[8]

Open reduction and internal fixation can reduce the fracture anatomically but chances of loss of elbow motion are high.[9]

The importance of our study is to draw the attention of orthopedic surgeons to PCP for the treatment of displaced supracondylar fracture of humerus in children with which the chances of loss of elbow motion and cubitus varus deformity are minimal.

## MATERIAL AND METHODS

This study was conducted at Orthopedic unit of Khyber Teaching Hospital, Peshawar from 1996 to 2000. Orthopedic unit at KTH is an 80 beds unit receiving patients through casualty and OPD.

The inclusion criteria was children of 3-12 years age with close and displaced supracondylar fracture of humerus with presentation within 72 hours after fracture. The exclusion criteria were compound fracture or fracture with vascular compromise.

Under general anesthesia and supine position the involved elbow was scrubbed. Fracture was closely reduced by gentle traction, side to side elbow deformity correction and hyperflexion of elbow and pushing the distal fragment with opposite hand thumb, keeping the forearm in pronation to prevent displacement. This position was maintained by applying sterile roll gauze to wrist and upper arm.

After close reduction either medial or lateral pin was passed first depending upon the displacement of distal fragment i.e posteromedial and postero-lateral respectively. Pins should cross each other proximal to the fracture at an angle of about 30 degree to the humeral shaft. For posteromedial displacement the arm was placed in maximum external rotation on the flourscopy plateform and the medial pin was inserted first obliquely through the medial epicondyle just proximal to the olecranon fossa with the direction slightly anterior. Ulnar nerve was protected by milking with thumb posteriorly. In case of swelling a small incision was made through the skin over the medial epicondyle and then medial pin was inserted.

For lateral pin insertion in posterolateral displacement arm was placed in internal rotation on flourscopy plateform. Pin was inserted in the centre of lateral condyle directed slightly posteriorly i.e 35 degree upward and 10 degree posterior and to avoid olecranon fossa while passing through the far cortex. Now the stability and carrying angle was checked by extending the elbow.

In our study we put two cross K-wires to get more stability as compared to two lateral K-wires.[10] K- wires were of 1.6 mm thickness[11].

Post operatively patients were followed for six months, initially at two weeks interval for one month when K – wire was removed and then at one monthly interval for next five months.

In follow up patients were assessed according to Flynn criteria[12] (table-1). During follow up visits assessment of carrying angle and range of motion of elbow was done clinically which is sufficient to assess outcome of procedure adopted[13].

The limitation of our study was that the follow up was for only six month duration, because in our set up for most of the patients it is not feasible to come for follow up for longer period. Although cubitus varus may take one year to develop but we can have some idea about the development of cubitus varus within six months like in other studies with six months follow up [14].

**Table-1: Flynn Criteria for Reduction Assessment**

| RESULTS | Cosmetic factor–loss of carying angle (degree) | Functional factor – loss of motion (degree) |
|---|---|---|
| **Excellent** | 0 – 5 | 0 – 5 |
| **Good** | 6 – 10 | 6 – 10 |

| | | |
|---|---|---|
| **Fair** | 11 – 15 | 11 – 15 |
| **Poor** | > 15 | > 15 |

## RESULTS

Of the total twenty patients presenting during this duration, fourteen (70%) were male and six (30%) female. Nineteen (95%) patients presented with extension type of supracondylar fracture while 01(05 %) with flexion type. Elbow on left side was involved in 15(75%) patients and right side in 05 (25%) patients. Type II fractures were six (30%) and type III were fourteen (70%).

Male to female ratio was 2.3:1 with mean age of 6.8 years. Ratio of left to right side fracture was 3:1. Age range was from three to twelve years with maximum patients received between six to eight years (n:11).

According to Flynn criteria 13 (65 %) patients were found to have excellent outcome (i.e., both loss of elbow motion and loss of carrying angle = 0–5 degree).

Four (20 %) patients turned out with good out come (i.e., both loss of elbow motion and loss of carrying angle=6–10 degree).

Three (15 %) patients turned out with poor outcome (i.e. either loss of elbow motion or loss of carrying angle=>15 degree). So the acceptable results in our study were in seventeen (85%) patients.

None of the 20 patients turned out with fair results (i.e., both loss of elbow motion and loss of carrying angle=11–15 degree)

In the follow up 2(10%) patients got cubitus varus, 1(5%) elbow stiffness, 2 (10%) pin tract infection, and 1(5%) transient ulnar nerve palsy. Vascular compromise was reported in none of the patients.

**Table-2:Results:(According to Flynn criteria)**

| RESULTS | Number of patients | Percentage |
|---|---|---|
| **Excellent** | 13 | 65% |
| **Good** | 4 | 20% |
| **Fair** | o | 0% |
| **Poor** | 3 | 15% |

## DISCUSSION

PCP has become standard technique for stabilizing Gartland[15] types II & III fractures, either two lateral pins or one lateral and one medial pin may be used and both should penetrate the far cortex.

Medial and lateral pin insertion provides better stabilization[10] and assesment of carrying angle is easy with full elbow extension while two lateral pins may not permit full elbow extension, thus preventing full assesment of carrying angle.

**Table-3 : Gartland[15] classification of supracondylar fracture of humerus in children**

| |
|---|
| Type I – Undisplaced<br>Type II - Displaced with intact posterior cortex<br>Type III - Completely displaced with no contact between the fragments |

Percutaneous pinning in unstable or irreducible supracondylar fracture is the treatment of choice with elbow in 90˚ flexion to reduce chances of vascular compromise.[16]

PCP as compared to ORIF has less chances of elbow stiffness[9] and is cost effective in terms of no use of suture material, prolonged prophylactic antibiotics and short hospital stay. PCP as compared to cast immobilization is safe in terms of negligible chances of compartment syndrome and loss of reduction.[8]

By Flynn criteria[12] we had excellent results in 13(65 %) patients which is compatible with the results of Ababneh et al[17] and Umer et al[18] who recorded 87 and 100% results with excellent prognosis respectively. Similarly the rate of poor prognosis of 03 patients (15 %) is comparable with the 08 % recorded by Ababneh et al[17].

In another study[19] on 71 patients,47 (66.2%) were boys and 24 (33.8%) were girls, with left side involement in 49 (69.1%) patients and right side in 22 (30.9%), and the acceptable results (good/excellent) were 91.8%. This study is comparable with our study.

In a study [14] on twenty four patients with age range from three to eleven years with male predominance 83% and female 17%, with 16% having pin tract infection and one patient(4%) developed per operative ulnar nerve injury(which recovered completely) . In this study good functional results were obtained in 21 (92% and poor results in 2 (8%) at the end of follow up. These results are almost similar to our results

Our study reveals extension type of fracture in 19 (95%) and flexion type in 1 (5%) patients comparable with study conducted by Cekanauska et al,[20] in which 90 (96.7%) were extension type and 3 (3.3%) were flexion type. Gartland type II in our study were 6 (30%) and type III were 14 (70%) closely resembling the study conducted by Cekanauska et al. [20]

Thus after comparing our results with national and international study, our results are encouraging. We can achieve up to 100% excellent results if we could have practice this procedure in every displaced supracondylar fracture of humerusunder fluoroscope in children.

## CONCLUSION

Closed reduction and crossed percutaneous pinning in children for displaced supracondylar fracture of humerus is safe, time and cost effective method and gives stable fixation with excellent results.

## REFERENCES


1. Eliason EL. Dressing for supracondylar fracture of humerus. JAMA 1924; 82: 1934-5.
2. Wilson PD. Fractures and dislocation in the region of elbow. Surg Gynecol Obstet 1933; 56: 335-59.
3. Abraham E, Powers T-Vitt. Excremental hyper extension of supracondylar fracture in monkeys. Clin Orthop 1982; 171: 309-18.
4. Gillingham BL, Rang M. Advances in children elbow fractures (editorial). J Pediatr Orthop 1995; 15: 419-21.
5. McIntyre W. Supracondylar fracture of humerus. In: Eltts RM (ed) Management of paediatric fractures. New York: Churchill Livingstone, 1994: 167-91.
6. Cotton FJ. Elbow fractures in children. Ann Surg 1902; 35: 252-69.
7. Green NE. Overnight delay in the reduction of supracondylar fractures of the humerus in children. J Bone Joint Surg 2001; 83: 321-2.
8. Piron AM, Gronam HK, Kraj Bich JI. Management of displaced extension type of supracondylar fracture of humerus in children. J Bone Joint Surg 1988; 70-A: 641-50.
9. Sandegard E fracture of lower end of humerus in children. Treatment and end results. Act Chir Scand 1944;89:116-9
10. Mostafavi HR, Spero C. Crossed pin fixation of displaced supracondylar humerus fractures in children. Clin Orthop 2000; 376: 56-61.
11. O'Hara LJ, Barlow JW, Clarke NM. Displaced supracondylar fractures of the humerus in children. Audit changes practice. J Bone Joint Surg Br 2000; 82: 204-10.

12. Flynn JC, Mattews JG, Beriot RL. BUCD pinning of displaced supracondylar fracture of humerus in children. J Bone Joint Surg 1974: 56-A: 263-72.

13. Minkowitz B, Busch MT. Supracondylar fracture of humerus, current trends and controversies. Orthop Clin North Am 1994; 25: 581-94.

14. Iqbal J. Supracondylar Fracture of humerus in children- An experience of closed reduction and percutaneous pinning. Ann King Edward Med Coll Dec 2001;7(4):278-80

15. Gartland JJ. Management of supracondylar fracture of humerus in children. Surg: Gynecol Obstet 1959;109:145-54.

16. Rejholec M. Supracondylar fractures of the humerus in children – closed pinning. Sb Lek 1999;100:279-86.

17. Ababneh M, Shannak A, Agabi S, Hadadi S. The treatment of displaced supracondylar fractures of the humerus in children. A comparison of three methods. Int Orthop 1998; 22: 263-5.

18. Umar M, D Sousa OP. Supracondylar fracture of humerus in children. An analysis of different treatment modalities at the Agha Khan University Hospital Karachi, Pakistan. Pakistan J Surg 1991; 7: 16-22.

19. Din SU, Ahmad I. Percutaneous crossed pin fixation of supracondylar Humeral fracture in children. J Postgrad Med Inst Jun 2003;17(2):184-8.

20. Cekanauskas E ,Degliute R, Kalesinskas RJ. Treatment of supracondylar fracture in children according to Gartland classification. Medicina (Kaunas) 2003;39:379-83.

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