

Original Research Article

# FUNCTIONAL OUTCOME IN SUPRACONDYLAR HUMERUS FRACTURE IN CHILDREN- A COMPARATIVE STUDY

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## Abstract

**Introduction:** The aim of the study is to compare functional outcome of close and open cross pinning in treatment of supracondylar humerus fracture (Gartland type 3) in children. All patients operated with cross pinning were included in this study. The age range was 4-12 years at the time of surgery. All patients were followed till the fracture united radiologically.

**Materials and methods:** Cases with displaced supracondylar humerus fractures (Gartland type-3) admitted and treated by close and open cross pinning were included in the study. All patients which met the inclusion criteria were operated with either closed or open I cross pinning.

**Results:** Patients operated with closed pinning showed no residual loss of motion after union of fracture compared to group with open pinning (12.5%) however patients operated with closed pinning had temporary nerve palsy and one patient presented with cubitus varus deformity.

**Conclusion:** In our study after comparison of two groups one by closed pinning and other by open pinning we have found that closed pinning is associated with better functional outcome and is the procedure of choice and should be the preferred initial treatment in fresh cases of fracture supracondylar humerus. While loss of motion was more in Group D (loss of motion more than 15 degrees in 13.12% of patients) than in Group C (none) this was due to soft tissue dissection and was poorly tolerated by patients, complications associated with closed procedure being cosmetic (cubitus varus) and reversible (nerve injury) are well tolerated by patients than complications (stiffness) in open procedure.

**Keywords:** open pinning , closed pinning, cross pinning, gartland, supracondylar, humerus & children.

**Study Design:** Observational Study.

## 1. INTRODUCTION

For clarity, the distal humerus' intricate anatomy can be seen as a triangle. The olecranon fossa is a relatively narrow segment of bone located in the center of the triangle[1]. While

there is typically a 1 mm thickness of bone here, it is normal for children to have no bone at all; on radiographs, this appears as a "hole." The trochlea, which articulates with the ulna, and the capitellum, which articulates with the radius, make up the articular surface that forms the base of the a triangle[2]. The medial and lateral columns of the distal humerus, which support any forces applied across the elbow, can be viewed as strong columns of mostly cortical bone that form the two sides of the triangle. As they move from the triangle's base to its apex—which is very flat—the medial and lateral columns start to flatten and merge at that point. At the level of the olecranon fossa, when the medial and lateral columns start to flatten, supracondylar fractures occur[3]. To visualize the condyles, consider the base of the triangle, where the articular surface is joined by the medial and lateral columns.

Elbow is the hinge joint. The ulna's semilunar notch receives the trochlea of the humerus, and the humerus's capitellum articulates with the fovea on the radius head. These thickened areas are commonly referred to by the following designations, which designate them as separate ligaments. The radial collateral, ulnar collateral, anterior, and posterior ligaments[4].

The anterior surface of the joint is covered in a broad, thin layer of fibrous tissue called the anterior ligament. It is connected to the front surface of the ulna's coronoid process, the front of the medial epicondyle, the front of the humerus just above the coronoid and radial fossae below, and the annular ligament. It is continuous with the collateral ligaments on both sides[5]. Except for its most lateral portion, this ligament is located in the brachialis[6].

## 2. MATERIAL AND METHODS

Present study was conducted at Shyam Shah Medical College, Rewa on 30 cases with displaced supracondylar humerus fractures (Gartland type-3 - diagnosis was based on conventional X-ray imaging. ) admitted and treated by close and open cross pinning were included in the study. The age range was 4-12 years at the time of surgery. All patients were followed till the fracture united radiologically. Fractures resulting from sport activities, road traffic accidents, falling on the ground and motorbike or bicycle riding were included. Case selection was based on following criterion. For the sake of simplicity patients are randomly divided into two groups. Group "C" contains the patients who underwent closed pinning while group "O" contains the patients who underwent open pinning.

### INCLUSION CRITERION:-

All cases of displaced supracondylar fractures in patients

1. More than 4 years and less than 12 years of age
2. Those presenting within 7 days of injury

### EXCLUSION CRITERION:-

1. Pre-existing nerve lesion
2. Pre-existing deformity at the elbow
3. Cases having history of similar injury previously (re- fracture)

## 3. RESULTS

**Table 1: Functional outcome at 3 months**

	Carrying angle				Loss of motion			
	0-5	6-10	11-15	>15	0-5	6-10	11-15	>15
Group C	07	05	02	01	10	04	01	00
Group O	10	04	01	00	05	04	03	02

**Table 2: Type of reduction**

CROSS PINNING	NUMBER OF PATIENTS
CLOSE PINNING	14
OPEN PINNING	16

**Table 3: Outcome as per Flynn's criteria:**

	Satisfactory						Unsatisfactory	
	Carrying angle			Loss of motion			Carrying angle	Loss of motion
	Excellent	Good	Fair	Excellent	Good	Fair	Poor	Poor
<b>Group C</b>	57.14%	21.42%	14.2%	71.42%	21.42%	07.1%	07.14%	00.00%
<b>Group O</b>	68.75%	18.75%	12.5%	43.75%	25%	18.75%	00.00%	12.5%

No patient had pain or symptoms related to the elbow. No residual vascular deficits were noted.

**Table 4: Complications**

	Infection	Nerve palsy	Myositis ossificans	Cubitus varus
<b>Group C</b>	00	01	00	01
<b>Group O</b>	02	00	00	00

All infections were superficial (pin tract infections), healed with oral antibiotics. Nerve palsy was ulnar nerve neuropraxia, which spontaneously recovered at last follow up. No incidence of myositis ossificans in any patient.

#### 4. DISCUSSION

Iatrogenic injury to the ulnar nerve may occur even when the medial epicondyle is palpable[7]. Clinically it is not possible to accurately predict the location of the ulnar nerve prior to blind percutaneous crossed k-wire fixation of supracondylar fracture of humerus, so now there is discussion regarding the use of intraoperative nerve stimulation to localize the ulnar nerve prior to placement of the medial pin. In 2002, Wind William M.[9], Schwend RM, Richard M; Armstrong DG, reported the results of their study which aimed at determining if the ulnar nerve could be safely located pre-operatively by the surgeon involved. They also reported on a nerve stimulation technique to assist in determining the location of the nerve prior to blind pinning of the medial epicondyle. In 2000, Reynolds[10], Richards A K, Mirzayan, Raffy in an article described their method of placing a medial pin safely. Thus we see that both groups had not let the dust settle and a consensus refused to emerge. They said that, using the lateral view, externally rotate the arm until the teardrop is seen on end. A Kirschner wire is then placed over the arm to bisect the bone along its axis. A line is then applied and extended from the medial side of the arm across the end of the arm. From the Antero-posterior view, the medial and lateral columns are found, and the Kirschner wire is placed along the desired trajectory of the pain[11]. A line is then drawn on the arm to

give the visual cue, and the line is extended to bisect the line previously drawn along the long axis of the arm) The lateral pin is placed with the entry point being where the two line bisect and is inserted in a plane parallel to the lines. Resistance should be felt. Position is checked with the image intensifier. A second parallel pin can be placed using the same technique[12].

## 5. CONCLUSION

In our research, we compared two groups, one treated with closed pinning, the other with open pinning and results show that closed pinning is associated with a superior functional outcome. As such, it should be the chosen initial treatment in newly diagnosed cases of supracondylar humerus fractures. Out of various complications associated with supracondylar humerus fracture patients did not tolerate the soft tissue dissection as it was associated with the greater loss of motion in Group O (12.5% of patients) compared to Group C (none). Conversely, patients tolerated the reversible (nerve injury) and cosmetic (cubitus varus) complications associated with closed procedures better than they did the open procedure complications (stiffness). This shows that closed cross pinning should be favoured in patients presenting with fresh supracondylar humerus fractures as it leads to acceptable outcomes with minimal complications. However once the fracture is old these inclusion conditions may not be met and due to development of adhesions or some other complications open fixation might be a preferred approach for better anatomical reduction followed by supervised physiotherapy to achieve good functional outcome.

## 6. REFERENCES

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