



## COMPARISON OF OUTCOME OF SUPRACONDYLAR FRACTURES OF HUMERUS IN CHILDREN TREATED WITH CROSS PINNING AND LATERAL PINNING

### Orthopedics

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### ABSTRACT

**Background:** The choice of pinning techniques in supracondylar fractures of the humerus has been a topic of debate. This study was performed to compare the functional outcomes of supracondylar fractures of the humerus treated with cross pinning and lateral pinning. **Methods:** A prospective, randomized, study was conducted at the JLN Medical College, Ajmer from December 2018 to June 2020. 32 children with supracondylar fractures were included. **Results:** Flynn's Criteria was used for evaluation of results. No significant difference was found between the two groups in terms of loss of ROM, loss of carrying angle, loss of Baumann angle and Flynn's Grading. **Conclusions:** We observed that both methods of pinning (crossed and lateral) offer consistently satisfactory functional and cosmetic results.

### KEYWORDS

Fracture Supracondylar Humerus, Lateral Pinning, Cross Pinning, Flynn's Grading

### INTRODUCTION

Supracondylar fractures of humerus are the most common elbow injury in children and make up approximately 60% of all elbow injuries. They involve the thin distal portion of the humerus through olecranon fossa or just above the fossa or through the metaphysis. Most of the fractures are extension type which are usually the result of a fall onto an outstretched extremity, producing hyperextension of elbow. Most of the fractures are displaced postero-medially. The proximal metaphyseal spike penetrates laterally with posteromedially displacement and places the radial nerve at risk. With posterolateral displacement, the spike penetrates medially and places median nerve and brachial artery at risk.

AP and lateral views are recorded for all distal humeral fractures. An undisplaced supracondylar fracture is sometimes not visualized on plain radiographs and the only sign is an elevated posterior fat pad.

Complications include neurovascular injury (primary or iatrogenic), cubitus varus and cubitus valgus, myositis ossificans, tardy ulnar nerve palsy and loss of mobility.

The history of management of supracondylar fractures dates back to 1824 when Astley Cooper<sup>1</sup> advised fixation along with a POP slab method which was later advocated by Robert Jones<sup>2</sup> (1921), Watson Jones<sup>3</sup> (1955) and Charnley<sup>4</sup> (1961).

Various configurations of Kirschner wires were evaluated for stabilizing the reduction. Zions et al<sup>5</sup> in his study found the two cross pins provided maximum stability. Penafort and Sharaf (2001) did a retrospective study on 56 patients and concluded that the lateral percutaneous pinning technique offers a viable alternative as it offers the same stability without risk of iatrogenic ulnar nerve injury<sup>6</sup>. Skaggs<sup>7,8</sup> concluded that the use of lateral pins alone was effective for the most unstable supracondylar humerus fractures without loss of reduction and iatrogenic ulnar nerve injury if the pins engaged both cortices, and both fragments maximally separated at fracture site. Kocher et al<sup>9</sup> (2007) found no significant difference between the rates of loss of reduction, iatrogenic ulnar nerve injury, change in the Baumann angle, Flynn grade, carrying angle, elbow flexion, elbow extension, total elbow range of motion, return to function, or complications in either group.

### AIMS AND OBJECTIVES

Compare the functional outcomes of supracondylar fractures of humerus in children treated with cross pinning and lateral pinning.

### MATERIALS AND METHODS

A prospective, randomized, single center, controlled study was conducted at the Orthopaedic Department of JLN Medical College, Ajmer from December 2018 till June 2020. 32 children were included in study.

### Inclusion Criteria:

1. Age between three to twelve years.
2. Those presented within 0 to 7 days.

### Exclusion Criteria:

1. Undisplaced fractures
2. Pathological Fractures

### Surgical Technique:

Prior to reduction, a careful inspection of the soft tissues is performed. A period of gentle but sustained traction is maintained for 5-10 minutes (Figure 1).



**Figure 1: Traction with elbow extended**

Angulation and translation are corrected by direct manipulation. Thumb is positioned over the olecranon and pushed distally and anteriorly, whilst the elbow is smoothly flexed. The reduction is verified on AP and lateral views.

For Lateral Pinning, the first K-wire is inserted within the lateral column and should achieve strong purchase in the medial cortex of the proximal fragment (Figure 2). The second K-wire is inserted from the lateral side into the medial column (Figure 3). The pin spread at the fracture site should be more than 1/3 of the bone diameter.



**Figure 2: Insertion of 1<sup>st</sup> lateral pin**



**Figure 3: Insertion of 2<sup>nd</sup> lateral pin**

For Cross Pinning, the first lateral pin is inserted as described above. Then the elbow is semi-flexed and medial epicondyle is palpated, and a 1 cm longitudinal skin incision is made directly over the prominence of the medial epicondyle. The K-wire is inserted through the medial epicondyle and across the fracture in the medial column (Figure 4).



**Figure 4: Insertion of medial pin**

## DISCUSSION

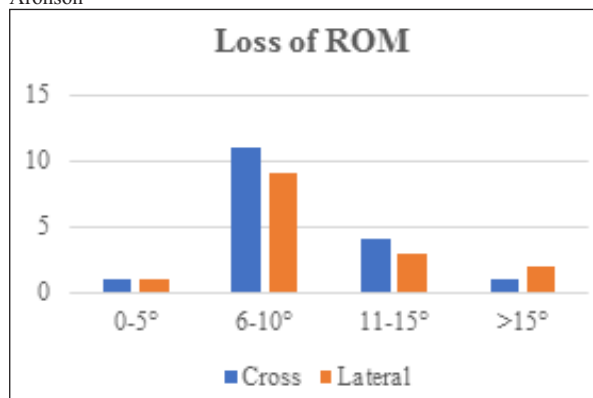
In this study, thirty-two children with supracondylar fractures of humerus who were treated with closed reduction and percutaneous pinning were evaluated.

The study group included children between 3 and 12 years. The peak incidence was in 5-7 years age group with an average age of 6.78 years. Incidence in male children was 66%. The left side was involved in 59.4% of cases.

Most of the fractures (90.6%) were of Gartland type 3. Type 1 and most of the Type 2 fractures were managed conservatively and hence were excluded from this study. 2 cases of Type 2 fractures were included for which close reduction and casting did not yield satisfactory results. Fractures with instability in all planes (Type 4) were managed by open reduction and hence were excluded from the study. 1 case of Flexion type Supracondylar fracture was also included in this study.

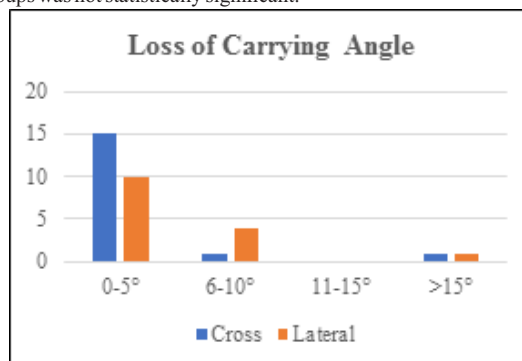
Among the Gartland Type 3 fractures, 76% had posteromedial displacement while 24% had posterolateral displacement.

The average loss of range of movement was 10.35 degrees for cases with crossed pinning and 10.53 degrees for cases with lateral pinning. The difference between two groups was not statistically significant. Similar results were shown by Kocher et al.<sup>9</sup>, Mostafavi<sup>10</sup>, and Aronson<sup>11</sup>



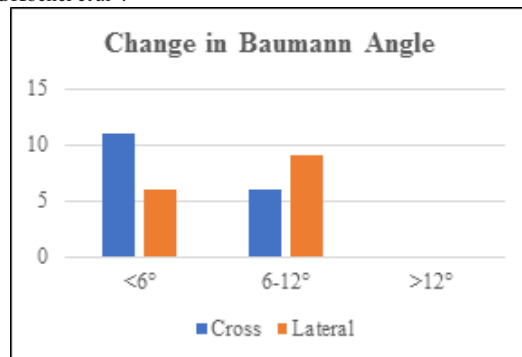
**Figure 5: Loss of ROM**

The average loss of Carrying angle was 3.4 degrees for cases with crossed pinning and 4.1 degrees for cases with lateral pinning. Average change in Baumann angle in Cross pinning group was 5.2° while in Lateral Pinning group was 6.1°. The difference between the two groups was not statistically significant.



**Figure 6: Loss of CA**

Average change in Baumann angle in Cross pinning group was 5.2° while in Lateral Pinning group was 6.1°. The difference was not statistically significant. According to Skaggs's Grading, 11 patients in cross pinning group and 6 patients in lateral pinning group had no displacement. 6 patients in cross pinning group and 9 patients in lateral pinning group had mild displacement. No patient in either group had major displacement. Similar results were obtained in series by Skaggs<sup>8</sup> and Kocher et al.<sup>10</sup>

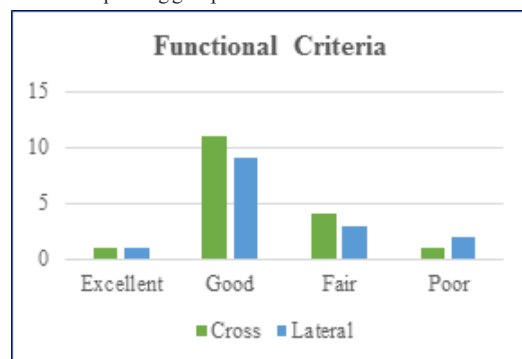


**Figure 7: Loss of BA**

4 patients in cross pinning group and 3 patients in lateral pinning group had superficial infection at 4 weeks of follow-up. Infection resolved after removal of pins and none of the patients had infection at subsequent follow-up.

None of the patients developed deep infection at any time during follow-up. 1 patient (5.88%) in Cross pinning group developed ulnar nerve palsy after surgery that resolved at 3 months of follow-up. No patient in Lateral pinning group developed any kind of nerve palsy.

According to Flynn's functional criteria, 16 patients (94.1%) had satisfactory results (1 excellent, 11 good, 4 fair) and 1 patient had poor result in cross pinning group, while 13 patients (86.7%) had satisfactory results (1 excellent, 9 good, 3 fair) and 1 patient had poor result in lateral pinning group.



**Figure 8: Flynn's Functional Criteria**

According to the cosmetic criteria, 16 patients (94.1%) had satisfactory results (15 excellent, 1 good) and 1 patient had poor result in cross pinning group while 14 patients (93.3%) had satisfactory results (9 excellent, 5 good) and 1 patient had poor result in lateral pinning group. Results were comparable to the study by Vito P et al<sup>12</sup>, who observed more than 90% satisfactory results and Fowles & Kassab<sup>13</sup> who observed satisfactory results in 87.5% cases.

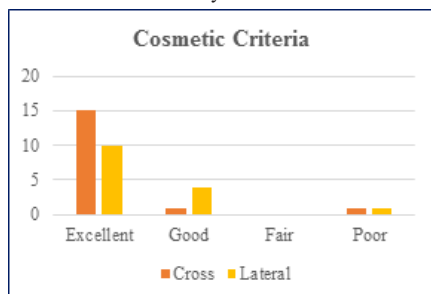


Figure 9: Flynn's Cosmetic Criteria

## CONCLUSION

In our study, we observed that closed reduction and percutaneous pinning is an excellent method of treatment of displaced supracondylar fractures in children. Crossed medial and lateral pinning is the treatment of choice in these fractures, with careful technique which safeguards the ulnar nerve.

We also observed that the lateral pinning is an equally good treatment choice especially for the grossly swollen elbows in which the medial epicondyle is barely palpable with increased risk of ulnar nerve injury during the placement of the medial pin.

Both the methods offer consistently satisfactory functional and cosmetic results.

## CLINICAL PICTURES

### Cross Pinning – Radiographs

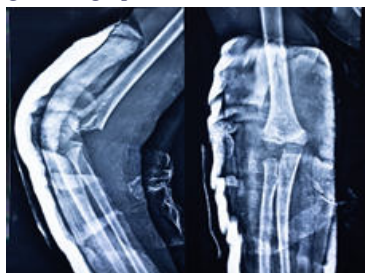


Figure 10: Pre-op Radiograph

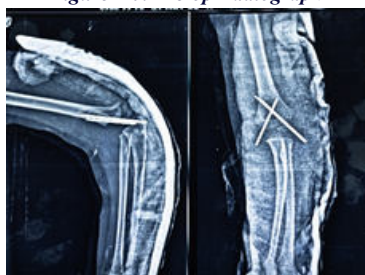


Figure 11: Post-op Radiograph



Figure 12: Follow-up at 6 months

### Cross Pinning - ROM



Figure 13: Elbow extension at 6months



Figure 14: Elbow Flexion at 6 months

### Lateral Pinning -Radiographs



Figure 15: Pre-op Radiograph

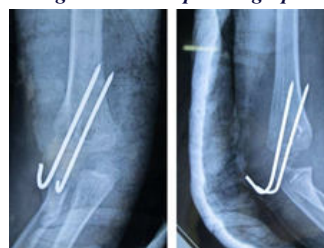


Figure 16: Post-op Radiograph

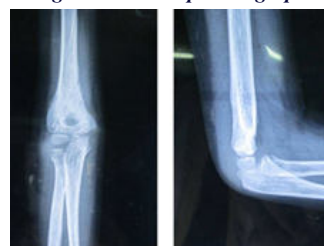


Figure 17: Follow-up at 6 months

### Lateral Pinning -ROM



Figure 18: Elbow extension at 6months



*Figure 19: Elbow Flexion at 6 months*

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