

A PROSPECTIVE COMPARATIVE STUDY OF FUNCTIONAL OUTCOMES OF CROSS PINNING VERSUS LATERAL PINNING IN PAEDIATRIC SUPRACONDYLAR HUMERUS FRACTURES

Orthopaedics

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ABSTRACT

Background: Supracondylar humerus fractures are the most common paediatric elbow fractures. Closed reduction with percutaneous pinning is the standard treatment, but the optimal pin configuration remains controversial. [1-3] **Objective:** To compare functional and clinical outcomes of cross pinning versus lateral pinning in children with displaced supracondylar humerus fractures. **Methods:** A prospective comparative study was conducted on 40 children (<15 years) with Gartland type II–IV fractures treated by closed reduction and K-wire fixation. Outcomes were assessed using range of motion, carrying angle, and Flynn's criteria. **Results:** No statistically significant differences were observed between groups. **Conclusion:** Both techniques provide comparable outcomes; however, lateral pinning offers a safer profile.

KEYWORDS

INTRODUCTION

Supracondylar humerus fractures are the most common elbow fractures in children, accounting for nearly 60–70% of cases. [1,4] These injuries usually occur due to a fall on an outstretched hand and are predominantly extension-type fractures. [4]

These fractures are clinically important because of their proximity to vital neurovascular structures, including the brachial artery and median nerve, which may result in complications such as compartment syndrome and Volkmann's ischemic contracture. [1,13]

Closed reduction with percutaneous pinning is considered the gold standard for displaced fractures. [3,5] Two commonly used fixation techniques include cross pinning and lateral pinning.

Cross pinning provides superior biomechanical stability, particularly against rotational forces. [8] However, it carries a higher risk of iatrogenic ulnar nerve injury. [9,13]

Lateral pinning, on the other hand, avoids ulnar nerve injury and is considered safer, although concerns remain regarding its stability. [6,7]

Recent studies and meta-analyses suggest that both techniques provide comparable outcomes, with lateral pinning offering a better safety profile. [10-12]

MATERIALS AND METHODS

Study Design and Setting

This prospective comparative interventional study was conducted in the Department of Orthopaedics at Zydus Medical College & Hospital, Dahod, between October 2024 and December 2025.

Sample Size

A total of 40 patients were included.

Inclusion Criteria

- Age <15 years
- Gartland type II, III, IV fractures
- Closed fractures
- Treated by closed reduction

Exclusion Criteria

- Type I fractures
- Open fractures
- Open reduction cases

Grouping

- Group A: Cross pinning (n=20)
- Group B: Lateral pinning (n=20)

Surgical Procedure

All patients underwent closed reduction under fluoroscopic guidance followed by percutaneous fixation using K-wires.

Outcome Measures

- Range of motion (flexion and extension)
- Carrying angle
- Flynn's criteria

Statistical Analysis

Data were analyzed using SPSS v25. Chi-square test and unpaired t-test were applied. A p-value <0.05 was considered statistically significant.

RESULTS

Both groups were comparable in demographic and clinical parameters, consistent with previous studies. [18]

There was no statistically significant difference between the groups in:

- Flexion (p=0.61)
- Extension (p=0.11)
- Carrying angle (p=0.28)

Functional outcomes assessed using Flynn's criteria^[2] showed:

- Excellent results in 95% (lateral) and 85% (cross pinning)

These findings are consistent with previous literature showing comparable outcomes between techniques. [10,11]

Only one complication (pin tract infection) was observed in the cross pinning group, similar to previous studies reporting low complication rates. [15]

DISCUSSION

The present study demonstrates that both lateral and cross pinning

techniques provide comparable functional and radiological outcomes, consistent with earlier studies. [10-12]

Biomechanically, cross pinning has been shown to provide greater torsional stability. [8] However, the increased risk of ulnar nerve injury remains a significant concern. [13]

Lateral pinning, especially when performed with two or three divergent pins, provides adequate stability while eliminating the risk of ulnar nerve injury. [6,7]

Meta-analyses have consistently shown no significant difference in functional outcomes between the two techniques, although cross pinning may have slightly better stability and lateral pinning a better safety profile. [10-12]

Thus, the choice of technique should be based on fracture stability, surgeon expertise, and intraoperative findings. [20]

CONCLUSION

Both cross pinning and lateral pinning are effective methods for treating paediatric supracondylar humerus fractures.

- Functional outcomes are comparable
 - Lateral pinning is safer due to reduced nerve injury risk
- Lateral pinning is therefore recommended as the preferred technique in most cases.

LIMITATIONS

- Small sample size
- Single-center study
- Short follow-up duration

DECLARATIONS

Ethical Approval: Obtained
Funding: None
Conflict of Interest: None
Informed Consent: Obtained

FIGURES AND GRAPHS

FIGURE 1 – Treatment Distribution

Type: Bar Graph
Cross Pinning: 20
Lateral Pinning: 20

Caption:
Distribution of patients according to treatment modality.

FIGURE 2 – Age Group Comparison

Type: Clustered Bar Graph

Age Group	Cross Pinning	Lateral Pinning
1–5 yrs	6	4
6–10 yrs	9	15
11–15 yrs	5	1

Caption:
Comparison of age distribution between cross pinning and lateral pinning groups.

FIGURE 3 – Fracture Type Distribution

Type: Clustered Bar Graph

Gartland Type	Cross	Lateral
Type II	7	10
Type III	9	4
Type IV	4	6

Caption:
Comparison of fracture types between both groups.

FIGURE 4 – Range of Motion Comparison

Type: Comparative Bar Graph

Parameter	Cross Pinning	Lateral Pinning
Flexion	138.25°	138.75°
Extension	2.75°	1.50°

Caption:
Comparison of elbow range of motion between the two groups.

FIGURE 5 – Flynn Outcome

Type: Clustered Bar Graph

Outcome	Cross	Lateral
Excellent	17	19
Good	2	0
Fair	1	1

Caption:
Comparison of functional outcomes using Flynn's criteria.

FIGURE 6 – Carrying Angle Loss

Type: Clustered Bar Graph

Loss (°)	Cross	Lateral
Nil	16	19
5°	2	0
10°	2	1

Caption:
Comparison of carrying angle loss between groups.

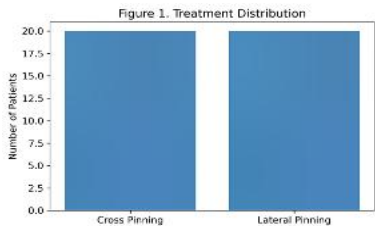
FIGURE 7 – Complications

Type: Bar Graph

Complication	Cross	Lateral
Pin tract infection	1	0

Caption: Comparison of complications between groups.

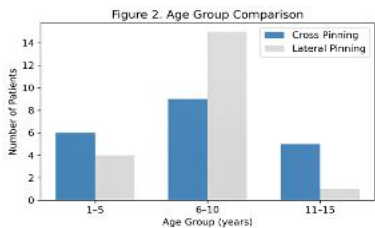
Figure 1 Treatment Distribution



Cross Pinning : 20
Lateral Pinning : 20

Figure 1: Distribution of patients according to treatment modality.

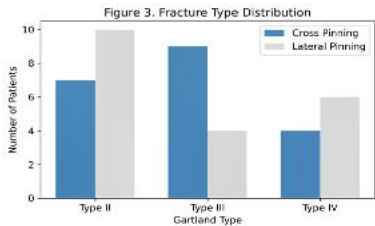
Figure 2 Age group comparison



Age Group	Cross Pinning	Lateral Pinning
1–5 yrs	6	4
6–10 yrs	9	15
11–15 yrs	5	1

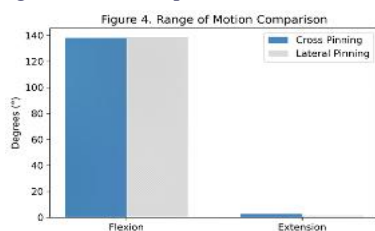
Figure 2: Comparison of age distribution between cross pinning and lateral pinning groups.

Figure 3 Fracture Type Distribution

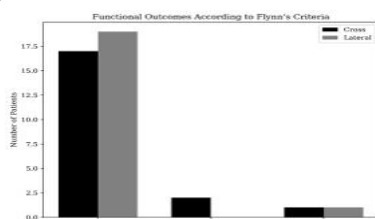


Gartland Type	Cross	Lateral
Type II	7	10
Type III	9	4
Type IV	4	6

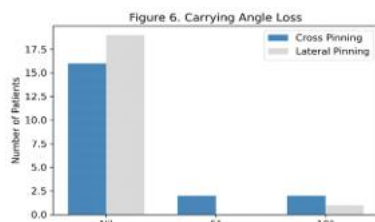
Figure 3: Comparison of fracture types between both groups.

Figure 4 Range of Motion Comparison

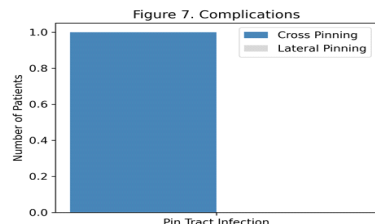
Parameter	Cross Pinning	Lateral Pinning
Flexion	138.25°	138.75°
Extension	2.75°	1.50°

Figure 4: Comparison of elbow range of motion between the two groups.**Figure 5 Flynn Outcome**

Excellent	17	19
Good	2	0
Fair	1	1

Figure 5: Comparison of functional outcomes using Flynn's criteria.**Figure 6 Carrying Angle Loss**

Loss (°)	Cross	Lateral
Nil	16	19
5°	2	0
10°	2	1

Figure 6: Comparison of carrying angle loss between groups.**Figure 7 Complications**

Complication	Cross	Lateral
Pin tract infection	1	0

Figure 7: Comparison of complications between groups.**REFERENCES (VANCOUVER STYLE)**

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