

## A STUDY OF PERCUTANEOUS FIXATION OF DISPLACED SUPRACONDYLAR FRACTURE OF HUMERUS IN CHILDREN

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### ABSTRACT

#### BACKGROUND

Closed reduction and percutaneous K-wire fixation is the standard modality of treatment in displaced supracondylar fractures of distal humerus in children. We report the result of a prospective study of fifty patients, who were treated by closed reduction and simple percutaneous K-wire fixation using two lateral pins.

#### MATERIALS AND METHODS

In a prospective controlled study, 50 cases of displaced supracondylar humerus fractures in children were treated with closed reduction and percutaneous fixation by simple K-wires. The age group of the patients was upto 14 years. The fracture was immobilised for duration of three weeks. Cases were followed up for an average of 6 weeks post-operatively and all the early and late post-operative complications were recorded on the given proforma. Evaluation of the results was done on the basis of Flynn's criteria by measuring loss of elbow motion and carrying angle.

#### RESULTS

A total of 50 patients completed the study. The mean age was 6.4 years with a gender distribution of 36 males and 14 females. The involved elbow was right in 28 (56%) patients and 22 (44%) patients had left-sided injury. There were 20 (40%) Gartland Type II fractures and 30 (60%) Gartland III fractures. One patient (2%) had pin tract infections, whereas none had osteomyelitis, neurovascular damage or compartment syndrome. 43 patients (86%) had excellent results according to Flynn's criteria, whereas one patient (2%) had poor result.

#### CONCLUSION

Closed reduction under image intensifier and percutaneous K wiring through lateral approach in Gartland Type II and III fractures in children is a safe procedure and provides adequate stabilisation with satisfactory results without any risk to ulnar nerve injury.

#### KEYWORDS

Humerus, Supracondylar Fracture, Percutaneous Pinning, Lateral Pinning.

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#### BACKGROUND

Supracondylar fracture of humerus is one of the most common fractures amongst children.<sup>1,2,3</sup> Supracondylar area is the weakest bony region of the upper limb and is most commonly injured by a fall on an outstretched hand.<sup>4</sup> There are two types of supracondylar fractures of humerus in children, i.e. extension type (97%) and flexion type (3%). Mechanism of injury commonly is a fall on dorsiflexed hand with flexed elbow resulting in hyperextension along with abduction or adduction of elbow.<sup>1,4</sup> Supracondylar fractures of humerus have been classified by many surgeons, but Gartland classification is commonly used.<sup>5</sup> Based on this classification Type II and III fractures usually require operative intervention. There are multiple treatment options comprising closed reduction and POP cast, skeletal traction, closed reduction with percutaneous fixation and open

reduction and fixation.<sup>2,3,5</sup> Closed reduction and POP casting leads to loss of reduction and varus deformity in some cases. Open reduction and internal fixation can reduce the fracture anatomically, but there may be elbow stiffness and chances of loss of range of motion.<sup>6</sup>

We have studied the postoperative outcome of percutaneous lateral K-wire technique in closed Gartland II and III fractures in paediatric population coming to our hospital set-up. The purpose of our study was to highlight the advantages of this technique in reducing the morbidity, hospital stay, elbow stiffness and deformity in children.

#### MATERIALS AND METHODS

This descriptive study was carried out at SRG Hospital and Medical College, Jhalawar from December 2015 to December 2016. The inclusion criteria were patients of both genders upto 14 years of age, presenting in emergency or outpatient department within 24 hours of injury without vascular compromise and diagnosed as cases of closed Gartland Type II or Type III fractures (Table 1). The exclusion criteria were patients having open fractures, patients with old malunited fracture, patients with pathological fractures or patients who had any contraindication to general anaesthesia. All the patients who fulfilled the criteria were included in the study after taking a written informed consent. After the initial management and investigations, these patients underwent

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standard percutaneous fixation<sup>1,4</sup> with lateral K wiring under image intensifier. Under general anaesthesia and supine position closed reduction of the fracture was done by gentle traction, side-to-side elbow deformity correction, hyperflexion of elbow and pushing the distal fragment with opposite hand thumb, keeping the forearm in pronation to prevent displacement. After confirming closed anatomic reduction on AP and lateral view, the image-intensifier was used to guide insertion of 1.5/2 mm K-wire through lateral approach. POP above elbow slab was applied postoperatively and collar and sling bandage was given to the patients. The patients were discharged the next day and advised to follow up after one week for clinical and radiological evaluation, any wound infection, callus formation or any other complication. Patients were called at 3 weeks after surgery for removal of K-wires and slab. After clinical and radiological evaluation joint mobilisation was allowed. Patients were followed up on a weekly basis for upto 06 weeks and were evaluated clinically and radiologically for healing of fracture, joint deformity and range of motion (i.e. functional and cosmetic) according to Flynn's criteria<sup>7</sup> (Table 2). The clinical evaluation for pin tract infection and osteomyelitis was also done on each visit and all the data were endorsed in the proforma.

**RESULTS**

A total of 50 patients completed the study. The mean age was 6.4 years with a gender distribution of 36 males and 14 females. The involved elbow was right in 28 (56%) patients and 22 (44%) patients had left-sided injury. There were 20(40%) Gartland Type II fractures and 30 (60%) Gartland Type III fractures. One patient (2%) had pin tract infection, whereas none had osteomyelitis, neurovascular damage or compartment syndrome. 43 patients (86%) had excellent results according to Flynn's criteria, whereas one patient (2%) had poor result. According to Flynn's criteria<sup>7</sup> the range of motion loss and carrying angle loss was less than 5 degrees in 43 (86%) patients, hence their result was excellent (Figure). The results were good and fair in 3 (6%) patients each. Only 1 (2%) patient had poor outcome (Loss of range of motion) was more than 15 degrees or carrying angle loss was more than 15 degrees.



*Pre-Op X-Ray*



*Post-Op X-Ray*



*On Follow-Up*

**DISCUSSION**

Supracondylar fractures of humerus are the most common fractures in paediatric population accounting for upto 50%-70% of all fractures.<sup>2,8,9</sup> There have been many treatment options for Gartland Type II and III fractures ranging from closed reduction and plaster, side-arm traction, closed reduction and percutaneous pinning to open reduction.<sup>1,3,10,8</sup> Percutaneous K wiring can also be done via two different approaches (lateral only, medial and lateral crossed). All these procedures have their own merits, demerits and complications.<sup>9,11,12,13</sup> In this study we observed the clinical outcome of percutaneous K wiring via only lateral approach.

Type I	Nondisplaced fracture
Type II	Displaced fracture with intact posterior cortex
Type III	Displaced fracture with no cortical contact
	A: Posteromedial rotation of the distal fragment
	B: Posterolateral rotation of the distal fragment

*Table 1. Gartland<sup>4</sup> Classification of Supracondylar Fracture of Humerus in Children*

Results	Rating	Cosmetic factor: Carrying angle loss (degrees)	Functional factor: Motion loss (degrees)
Satisfactory	Excellent	0-5	0-5
	Good	5-10	5-10
	Fair	10-15	10-15
Unsatisfactory	Poor	>15	>15

**Table 2. Flynn's Criteria for Assessment of Reduction**

In our descriptive study, the mean age group was 6.4 years which was at par with majority of the studies and hence it was comparable.<sup>12,13,14</sup> The boys were affected more and this was also observed in other studies.<sup>15,16</sup> We observed that right elbow was more commonly involved, which was also consistent with findings of Soomro et al,<sup>15</sup> but contrasting with the study of Shoaib et al<sup>17</sup> in which the non-dominant limb was more commonly involved.

According to Flynn's criteria we had excellent results in 86% of cases, which was quite comparable to other studies<sup>12,17</sup> but greater than in a study by Ahmad et al<sup>14</sup> (63.3%).

The percentage of cases with poor outcome in our study was 2%, which was less than in a study carried out by Shoaib et al who observed poor outcome in 15% cases.

#### CONCLUSION

Closed reduction and percutaneous lateral pinning with K-wire give stable fixation with minimal soft tissue damage and negligible complication. It is a safe and effective treatment for displaced supracondylar fracture of humerus in children.

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