

**Research Article****Percutaneous Lateral Only Pinning of Supracondylar Humerus Fractures in Children**Chaitanya P.R<sup>\*1</sup>, Naveen P.R<sup>2</sup>, Chetan P.R<sup>3</sup>, Prashanth H.L<sup>4</sup>, Naveen Kumar D.B<sup>5</sup><sup>1,2</sup>Assistant Professor, Department of Orthopaedics, S.I.M.S, Shivamogga, Karnataka, India<sup>3</sup>Junior Resident, Department of Surgery, K.I.M.S, Hubli, Karnataka, India<sup>4</sup>Associate professor, Department of Community Medicine, S.I.M.S, Shivamogga, Karnataka, India<sup>5</sup>Junior Resident, Department of Orthopaedics, S.I.M.S, Shivamogga, Karnataka, India**\*Corresponding author**

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**Abstract:** Supracondylar fracture of the humerus is a common fracture in children. It accounts for 60% of fractures around the paediatric elbow. There is a lot of controversy regarding the optimum pin configuration in the treatment of displaced supracondylar fractures in children. Lateral pinning has fewer complications with regards to ulnar nerve injury but is said to be biomechanically less stable than crossed pinning. This study was undertaken to evaluate the efficacy of percutaneous lateral only pinning in the treatment of displaced supracondylar fracture of humerus in children. This was a prospective study conducted in Mc Gann Teaching Hospital, SIMS Shivamogga between October 2010 to September 2013. 40 children with Gartland type 2 and 3 supracondylar fractures of the humerus were treated with percutaneous pinning by 2 or 3 lateral only pins and followed clinically and radiologically and evaluated by Flynn's criteria. Percutaneous pinning was successful in 37 children (92.5%). According to Flynn's criteria results were excellent in 25 children, good in 10 children and fair in 2 children. No major complications were encountered. We concluded that percutaneous lateral only pinning is a safe and effective method of treating supracondylar humeral fractures in children.

**Keywords:** Supracondylar Fracture, Humerus, Percutaneous Pinning, Lateral Pinning, Flynn's criteria, Ulnar nerve injury.

**INTRODUCTION**

Supracondylar fracture of the humerus is the commonest fracture around the elbow in children. It accounts for around 60% of all fractures around the elbow [1]. It can cause significant deformity and morbidity if it is not treated properly.

Supracondylar humeral fracture usually results by a fall on the outstretched hand. The peak age range in

which it occurs is around 5-8 years [2]. The incidence is more in boys and the left or non dominant side is more frequently involved. This fracture may be flexion type or extension type based on the displacement of the distal fragment. Gartland classified the extension type of fracture into 3 types, Type 1 is undisplaced, Type 2 is posteriorly angulated with posterior cortex in contact and Type 3 is completely displaced.

**Table 1: Gartland classification of extension type of supracondylar humeral fractures**

Type	Displacement
1	Undisplaced
2	Displaced (with intact posterior cortex)
3	Completely displaced 3a - posteromedial 3b - posterolateral

Type 1 fractures are treated conservatively. Historically type 2 and 3 fractures have been treated by various methods like closed reduction and P.O.P application, Dunlop traction, skeletal traction, open reduction and K-wire fixation and closed reduction and percutaneous K-wire fixation with variable results [3-

8]. Presently closed reduction and percutaneous K-wire fixation is the treatment of choice for type 2 and 3 fractures. The K-wires are used in a crossed configuration with one wire from lateral condyle to medial cortex and another from medial to lateral cortex or only lateral pinning configuration with 2 or 3 K-

wires passed from lateral condyle to the medial cortex [9-13]. The crossed K-wire configuration is believed to be biomechanically more stable than lateral pinning [14,15] but carries a much higher risk of iatrogenic injury to the ulnar nerve as it lies behind the medial epicondyle [12,13,16].

There has been a continuous and ongoing debate among orthopaedic surgeons as to the better technique for fixation. This study was undertaken to study the clinical outcome of lateral only percutaneous pinning of supracondylar fractures of the humerus.

**MATERIALS AND METHODS**

40 children with type 3 supracondylar humeral fractures were included in the study. 25 were male and 15 were female children. The age range was 2 to 15 years. Mean age was 6.8 years. Among 40 children left side involvement was in 30 children, and right side was involved in ten children. Among 40 children the displacement was posteromedial in 28 children, the rest were posterolateral. Two children were excluded as closed reduction failed and open reduction was done. One child was lost to follow up. Closed reduction under fluoroscopic guidance done and percutaneously two to three K wires were inserted from lateral to medial in 37 children. Median nerve involvement was present in one child who recovered after closed reduction and pinning. One child had pink pulse less limb, colour Doppler showed no obvious vascular injury. The radial pulse recovered on the post op day two after closed reduction and percutaneous pinning. The average time lapse between injury and surgery was 26 hours. The average time taken for surgery was 15 min.

Under general anaesthesia, the child was put in supine position with a radiolucent side table for the affected upper limb. With the shoulder in 90 degrees of abduction and elbow in 25 degrees of flexion, traction was given by the surgeon holding the forearm. Counter traction was given by the assistant with a hand in the axilla of the child. Slight flexion of the elbow is necessary to prevent kinking of brachial artery. Traction is maintained for 1 minute and reduction is confirmed in AP view fluoroscopically. Now the elbow is flexed and fracture reduced by manipulation and confirmed by lateral view. We move the C-Arm for the lateral view and do not rotate the limb. After confirming good reduction in both AP and lateral view, K wires are passed from lateral condyle directed in parallel or divergent configuration. The K wires should just cross the medial cortex. Now the elbow is extended and stability of reduction is checked. Usually 2 K-wires (1.5mm or 2mm) are enough, occasionally 3 K-wires are necessary in unstable cases especially in the so called French type 5 (obliquity of the fracture from superolateral to inferomedial). We used 3 K-wires in 4 cases which included 3 French type 5 fractures. The K-wires were bent and cut. The elbow was immobilized with a posterior above elbow slab in 80-90 degree flexion of the elbow after confirming that the radial pulse was of good volume in this position.

Follow-up X-rays were done on the 1<sup>st</sup> wk, 3<sup>rd</sup> wk, 8<sup>th</sup> wk and 12<sup>th</sup> wk. The K-wires were removed after 3 or 4 wks. Active mobilization of the elbow was started after removal of K-wires. The range of motion and carrying angle were recorded at 8wks, 12 wks and 24 wks. The results were evaluated by Flynn's criteria. The follow up ranged from 5 - 36 months with a mean follow up of 14.3 months.

**Table 2: Flynn's criteria for grading of results**

Results	Rating	cosmetic factor: Functional factor:	carrying angle loss( in degrees) Motion loss( in degrees)
Satisfactory	Excellent	0-5 <sup>0</sup>	0-5 <sup>0</sup>
	Good	6-10 <sup>0</sup>	6-10 <sup>0</sup>
	Fair	11-15 <sup>0</sup>	11-15 <sup>0</sup>
Unsatisfactory	Poor	>15 <sup>0</sup>	>15 <sup>0</sup>

**RESULTS**

Among the 37 children in our series, the results were excellent in 25 children, good in 10 children and fair in 2 children. There were no poor

results. 94.5% were good to excellent results. There were no complications like pin tract infection, malunion, nonunion, iatrogenic ulnar nerve injury, compartment syndrome or myositis ossification.

**Table 3: The results in our series as graded by Flynn's criteria**

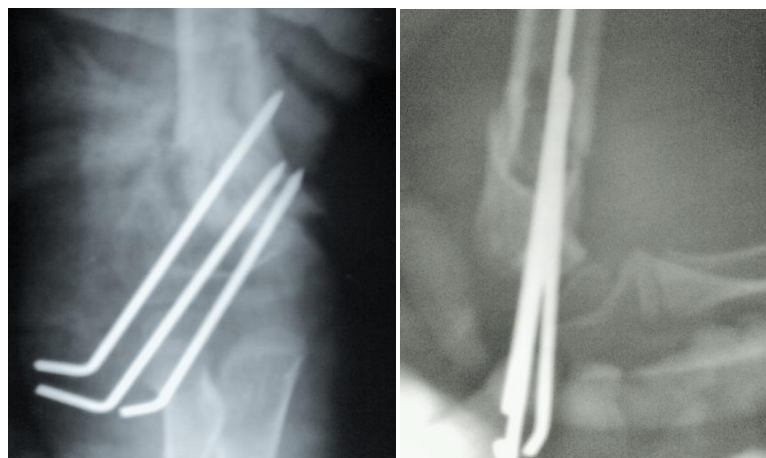
Results	Loss of motion	Number of children	Percentage	Carrying angle	Number of Children	Percentage
Excellent	0-5 <sup>0</sup>	25	67.5%	0-5 <sup>0</sup>	29	78.4%
Good	6-10 <sup>0</sup>	10	27%	6-10 <sup>0</sup>	07	18.9%
Fair	11-15 <sup>0</sup>	02	5.5%	11-15 <sup>0</sup>	01	2.7%
Poor	>15 <sup>0</sup>	--	--	>15 <sup>0</sup>	--	--



AP View

Lateral View

**Fig. 1: Pre Operative X- Ray of French Type 5 Fracture**



AP View

Lateral View

**Fig. 2: Post Operative X-Rays**



AP View

Lateral View

**Fig. 3: X-Rays after 6 Weeks of Follow Up**

## DISCUSSION

Supracondylar fracture of humerus is the common cause of morbidity in children if not treated properly. Closed reduction in displaced fractures and maintenance of reduction is difficult as it needs flexion of the elbow beyond 100 degrees which has a

deleterious effect on the blood supply to the forearm. Open reduction and internal fixation has its own disadvantages like infection, prolonged hospital stay, elbow stiffness etc. Closed reduction and percutaneous pinning avoids some of these problems and has become the mainstay of treatment of type 2 and 3 supracondylar

fractures of the humerus in children. The ideal configuration of K-wires to be used in supracondylar fracture of humerus in children i.e., crossed versus lateral only pinning is a matter of debate [9-13]. Biomechanical studies have shown that, crossed K-wires construct is more stable and more resistant to torsional stress compared to lateral only pinning [14, 15]. However crossed pinning has been associated to risk of iatrogenic ulnar nerve injury. Hence several studies have recommended lateral only pinning as a good alternative to crossed pinning because it does not carry the risk of iatrogenic ulnar injury [12,13,16].

In our study we have used lateral only pinning in 37 children, with good to excellent result in 35 children. These results correlate with most of the studies across the world.

### CONCLUSION

Taking in to consideration, the good to excellent results in 35 children (94.5%) in our study, we recommend lateral only pinning for supracondylar fracture of humerus in children as a good treatment modality with consistent reproducible results without running the risk of iatrogenic ulnar nerve injury.

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