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A Comparative study between Percutaneous cross vs Lateral K wire fixation in displaced supracondylar humerus fractures .

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Abstract :

Background: Supracondylar humerus fractures are one of the commonest fractures in the paediatric age group. Displaced fractures of these kind, that is, Gartland type III are treated by closed or open reduction and k wire fixation. Cross k wire and lateral wires are the commonest configurations used for fixation. The present study aims to evaluate the difference between the two configurations in terms of surgical technique, functional outcome and complications. **Objectives:** To compare the functional and radiological outcome of lateral and cross pinning of displaced supracondylar humerus fractures of children **METHODOLOGY:**This was a prospective comparative study of 40 paediatric patients with supracondylar fracture humerus in the department of Orthopaedics in a Tertiary care Centre after the inclusion & exclusion criteria were met. Immediately after admission , a detailed neurovascular examination was done. Anteroposterior & Lateral Radiographs of the elbow were taken & type of fracture was noted. Informed and written consent was taken from the parent/guardian. Then 20 patients were treated with Lateral K- wire technique (Group A) and another 20 patients with Cross K- wire (Group B) pinning technique of fixation. **Results:** The average follow-up period for patients in lateral K wiring technique was 12.23 ± 1.9 months while that for patients in cross K wiring technique was 11.26 ± 2.5 months. This difference was not found to be statistically significant. As per the Flynn criteria, 13 patients in group A had excellent results, 5 patients had good results and 2 patient had fair result. In group B, 12 patients had excellent results, 7 patients had good results and 1 patients (20.0 %) had fair results. No patients in either group had a poor result. **Conclusion:** Both lateral and cross k wire fixation are similarly effective techniques for stabilising supracondylar humerus fractures, with comparable functional, radiological, and aesthetic results.

KEYWORDS: Supracodylar, humerus, fracture, k-wire, cross, lateral, Children

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INTRODUCTION:

Supracondylar humerus fractures constitute 60–65 % of all the fractures around the elbow joint, with a peak incidence between 4 and 7 years of age in children . The main complications associated with supracondylar fractures are malunion, ischemic contracture and neurovascular damage. [1]

Supracondylar humerus fracture is the most common fracture around the elbow in Paediatric age group. Most common is the extension type injury. These fractures are usually classified using Modified Gartland Classification.[1,2]

Supracondylar fractures are commonly classified based on the Gartland system of classification, where they are divided into three types; Type I being non-displaced, Type II being displaced but with an intact posterior cortex and Type III being displaced and without any cortical contact , although there are more recent modifications . Type I are generally treated nonoperatively in an above-elbow plaster cast with the elbow in 60-90 degrees flexion for three weeks with radiographs to check for displacements. Type II and Type III are generally managed with closed reduction and pinning in order to prevent malunion . Displaced supracondylar humeral fractures can present with vascular and/ or neurological compromise in up to a fifth of cases. [3,4]

Of the methods described for the treatment of displaced extension-type supracondylar humeral fractures, closed reduction with percutaneous pin stabilization is the current preferred method of treatment . However, controversy persists between lateral or crossed medial and lateral pin fixation techniques. [5]

Closed Reduction & percutaneous K wire fixation has been considered Gold standard treatment in displaced Supracondylar humerus fractures. There have been lot of controversies with respect to fixation of supracondylar humerus fractures like Cross & lateral k wiring, 2 k wire & 3 k wire fixation, parallel & divergent K wiring etc.[6,7]

Objective :

The present study aims to compare the functional and radiological outcome of lateral and cross pinning of displaced supracondylar humerus fractures of children

METHODOLOGY:

This was a prospective comparative study of 40 paediatric patients with supracondylar fracture humerus in the department of Orthopaedics in a Tertiary care Centre after the inclusion & exclusion criteria were met. Immediately after admission , a detailed neurovascular examination was done. Anteroposterior & Lateral Radiographs of the elbow were taken & type of fracture was noted. Informed and written consent was taken from the parent/guardian. Then 20 patients were treated with Lateral K- wire technique (Group A) and another 20 patients with Cross K- wire (Group B) pinning technique of fixation.

Inclusion criteria:

All patients of age group of 2 years to16 years with Type II and III Supracondylar fracture of humerus.

Exclusion criteria :

- Gartland Type I fracture
- Open fracture

- Fracture with neurovascular injury
- Fracture requiring open reduction
- Previous fracture around the same elbow

After surgery patients were examined for neurovascular status. Patients were called for follow up at 1, 4, 6 and 12 weeks during which physical examination was done & radiograph was taken. Flynn's criteria was used for range of motion & loss of carrying angle and Skagg's criteria used to measure the loss of reduction.

Surgical Technique:

All surgeries were done by a single experienced surgeon. General anaethesia was used for all cases.Patient was placed in supine position. Under aseptic precautions, using Fluoroscopic guidance, traction & closed manipulation of the fracture was done. Reduction was assessed both clinically & under fluoroscopy by taking anteroposterior, lateral & Jones views.

Reduction was maintained by passing two Kirschner wires , either from both medial & lateral epicondyles (Cross pinning) or from lateral epicondyle(Lateral pinning) alone. In cross pinning technique, Lateral K wire was passed first so that during medial K wiring the elbow could be held in less flexion so as to avoid Ulnar nerve injury. After passing the K wires, the elbow was extended & reduction of the fracture was checked under C arm. After achieving the reduction, the K wires were bent & cut 1cm away from the skin. A posterior above elbow slab was applied with elbow in 90 degree flexion. Vascular status of the limb was monitored throughout the procedure by checking the pulse & capillary refill in the hand.

Neurovascular status of the limb was assessed in the immediate Post operative period, after 24 & 48 hours of surgery.

Patients were called for regular follow up at 1, 4, 8 , 12 & 24 weeks of surgery when & check Xrays were done to assess any displacement & pin tract infection.. After 4 weeks, slab was removed. Removal of the K wire was done after radiological union. After 6 months post surgery, clinical & cosmetic outcome was assessed using Flynn's criteria & Loss of reduction was assessed using Skagg's criteria.

Flynn criteria for grading of functional outcome

Results	***Rating***	***Cosmetic factor: carrying angle loss (degree)***	***Functional Factor: motion loss (degree)***
Satisfactory	Excellent	0 – 5	0 - 5
	Good	5 – 10	5 - 10
	Fair	10 – 15	10 - 15
Unsatisfactory	Poor	> 15	> 15

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Skaggs criteria for grading loss of reduction

Change in Baumann angle (degree)	*Loss of reduction Grading*
< 6	None
6 – 12	Mild
> 12	Major

RESULTS:

Mean age of the patients was years. Among the 40 patients , (25) were male & (15) were female. (30) were Right elbows & (10) were left elbows. There were (21) Gartland type II & (19) Gartland type III Fractures. Mode of injury in most cases was fall on outstretched hand. Mean hospital stay was (7.5) days.Mean follow up was (11.5) months.

The functional & cosmetic outcome was measured using Flynn,s criteria & loss of reduction was measured using Skagg's criteria.

The average follow-up period for patients in lateral K wiring technique was 12.23 ± 1.9 months while that for patients in cross K wiring technique was 11.26 ± 2.5 months. This difference was not found to be statistically significant.

As per the Flynn criteria, 13 patients in group A had excellent results, 5 patients had good results and 2 patient had fair result. In group B, 12 patients had excellent results, 7 patients had good results and 1 patients (20.0 %) had fair results. No patients in either group had a poor result.

Average change in carrying angle was 4.2 degree in lateral K wire and 3.7 degree in cross K wire technique. The difference in average change in carrying angle in the two groups was not significant statistically .

The functional outcomes in the two groups was also not statistically significant . Radiological union was good in all the fractures. No cases had cubitus varus deformity. 5 patients had pin tract infections, which was treated with regular dressing & antibiotics following which infection reduced.There were 3 cases with ulnar nerve palsy in cross pinning group which recovered within 3 months.

DISCUSSION:

Supracondylar humerus fractures require additional care and attention when it comes to treatment due to the potential for significant consequences. Complications from grade III fractures include damage to neurovascular systems, compartment syndrome, and VIC.

Therefore, it is crucial to address these fractures very away in order to prevent these complications. Treatment for type III fractures involves careful reduction and K-wire

fixation. Right now, the two widely used Cross wire patterns and two lateral wire patterns are two ways to repair k-wires. Even if the cross-K wire fixation is stable

The lateral K wire fixation has no risk of nerve palsy, but the biomechanical has a risk of ulnar nerve palsy. However, In particular against torsional forces, the lateral wire design is less stable than the cross k wire configuration.

The mean age groups in both the study groups in the present study were found to be comparable to the study findings of Babal J C et al [8] and Khademilhosseini M et al [9].

Supracondylar fractures frequently occur in children aged 4 to 10 years. Additionally, more men than women had the condition, and the left side of the body had more involvement, which is similar with a study of 57 individuals done by Naik et al.[10]

In the present study no significant difference was seen with the functional outcome was seen between either of the technique , which can be comparable to the study findings of Naik et al , [10] , Reynolds Et al [11] , Kocher et al [3] and Palange N D et al [12] . The angle of difference in the carrying angle between both the procedure was found to be statistically insignificant in the present study which is similar and comparable to the study findings of Naik et al and Palange N D et al .

The writers came to the conclusion that there In terms of functional results, loss of carrying angle, and Baumann's angle, there is a difference between the two ways. Additionally, there was no discernible difference in the two groups' times for radiological union, indicating equivalent efficiency of both methods for treating these fractures, allowing early mobility, and facilitating recovery to function.

Conclusion:

Both lateral and cross k wire fixation are similarly effective techniques for stabilising supracondylar humerus fractures, with comparable functional, radiological, and aesthetic results. By avoiding hyperflexion and cautiously retracting the nerve during the insertion of the medial wire, the risk of ulnar nerve palsy in cross-K wire fixation can be decreased**.**

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