Original Research Article

A Prospective Study of Percutaneous K Wire Fixation in Supracondylar Fracture Humerus in Children in Eastern Uttar Pradesh

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Abstract

Introduction*:*Supracondylar humerus fracture is the most common injury in children and make up approximately 60% of all elbow injuries. Many method have been proposed for the treatment of displaced supracondylar humerus fracture but Percutaneous K wire fixation have become the treatment of choice for most supracondylar fractures in children. The purpose of this study was to evaluate the clinical and functional outcome of the percutaneous K wire fixation of displaced supracondylar fracture humerus in children in Eastern Uttar Pradesh. **Materials AndMethods:**It was a prospective study in which 18 cases of displaced supracondylar fracture humerus in children aged between 3 to 12 years were treated by closed reduction and percutaneous K-wire fixation under C- arm guidance and were studied prospectively for clinical and functional outcome. 7 cases were treated by 2 cross k wire fixation 10 cases treated with 3 K wire fixation and 1 with lateral pinning. **Results:** The mean age at the time of operation was 7years (range 3-12 years) and the average duration of follow up was 6 months. The Flynn's criteria were excellent in 83%, good in 11%, and fair in 6%.**Conclusions:** Internal fixation with K-wire is the most commonly accepted treatment of displaced supracondylar humerus fracture in children when done at appropriate time. It gives more stable fixation, better anatomical reduction with negligible complication.

Keywords: Supracondylar humerus fracture, percutaneous k-wire fixation, Flynn's criteria.

Introduction

Supracondylar humerus fracture is one of the commonest fracture in children account for 60% of all fractures around elbow in children[1] and represent approximately 3% of all fracture in children[2].

Many methods have been proposed ranging from closed reduction and plaster cast immobilization, Dunlop's skin traction, skeletal traction, closed reduction and k-wire fixation to open reduction and k-wire fixation[3]. There are many complication of treatment of displaced fracture of supracondylar humerus fracture including Volkmann's ischemic contracture, nerve injury, arterial injury, myositisossificans and cubitusvarus deformity[3,4].

Closed reduction and percutaneous K-ire fixation was initially described by Swenson and later popularized by Flynn et al.

The purpose of this study was to evaluate clinical and functional outcome of closed reduction and percutaneous K-wire fixation in displaced supracondylar humerus fracture in children.

Materials and Methods

This was a prospective studydone in BRD medical college, Gorakhpur to study the clinical and functional outcomes of the displaced supracondylar fracture of humerus in children managed by closed reduction and percutaneous K-wire fixation. Eighteen consecutive displacedfractures of supracondylar humerus in children were included in the study in the time period of may 2020 to October 2020. The patients were managed primarily by closed reduction and percutaneous K-wire fixation and above elbow pop cast was applied for 3 weeks. Patients included in this study were sorted based on following preset inclusion and exclusion criteria. Patients of both sexes were recruited in the study.

Inclusion Criteria

1. Children between 3 to12 years age.
2. Gartland grade II and grade III displaced fractures.
3. Patients who were medically fit and parents willing for surgery.

Exclusion Criteria

1. Fracture older than 1week.

Patients were admitted both in emergencies and regular outpatient department of those suspected elbow injury. After detailed history, thorough examination and initial clinical assessment of all the patients were done to rule out any other associated injuries and splinting of affected limb was done. Standard antero-posterior and lateral view x-rays were taken to assess fracture pattern. Patients operated after proper counselling and consent.

Technique of K-Wire Fixation

All surgeries were performed under General anaesthesia. Traction was given under general anaesthesia with the elbow in extension and forearm in supinaton, longitudinal traction was given with an assistant applying counter traction. The fracture was thus disimpacted and then themedial and lateral displacement was corrected by applying a varus or valgus force. The angulation was corrected by flexing the elbow with continued traction. During the entire procedure, the radial pulse was observed at regular intervals. Reduction was checked by C-Arm image intensifier and radiological assessment was done by calculation of Baumann's angle.

If the reduction was clinic-radiologically acceptable the assistant held the elbow in same position and the k-wire (2-2.5mm)were passed from the lateral epicondyle through a stab wound. The K-wire was directed upward and medially at an angle of 35 – 40 degree to the saggital plane of the humerus and 100 degree posterior to the coronal plane of humerus. The k-wire thus passed through the distal fragment and medullary cavity of the proximal fragment to engage the cortex of the proximal fragment about 3 cm above the fracture line. The medial K-wire was inserted through the center of the medial epicondyle in a similar manner. The K-wire should cross each other 1.5 – 2 cm above the fracture line. The Ulnar nerve in the groove was

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easily avoided. Final reduction and K-wire placement was checked by both A-P and lateral view image under C-arm image intensifier. The k-wires were cut off subcutaneously and clinical assessment was done by checking the amount of flexion possible and by measuring the carrying angle of the forearm.

An above elbow plaster slab in 80-100 degree of flexion with full supination was applied. Radiological assessment was carried out by comparing preoperative fracture pattern with post operative reduction and to check for any redisplacement. Patients were discharged after 24 -48 hours and first follow –up was done after 1 week.

The patients were reviewed at weekly intervals. After 3 week slab was removed and X-Ray were taken in two plane AP and Lateral. In case of adequate callus formation K-wires were removed and active flexion and extension of the elbow was advised and in case of inadequate callus formation the K-wires were retained and intermittent active flexion and extension of elbow was advised after removing the slab for 2 more weeks. Patient was advised to avoid massage and passive stretching of the elbow. Patients were asked for regular follow up. During the follow up the patient were examined clinically and radiologically, assessed for range of motion and for union of fracture.

Statistical Analysis

The data obtained in the present study was reported as percentages.

Results

This is a prospective study conducted on 18 cases of supracondylar fracture (type II and type III), who underwent open/closed reduction with K-wire fixation between may 2020 and october2020, in BRD medical college, Gorakhpur. The following observations were made.

The age of patients ranged from 5-12 years. The average age was 7 years.

Table 1: Age distribution

Age (years)	Number of patients (%)
3-7	12 (67)
8-12	6 (33)
Total	18 (100)

This study from May 2020 to October 2020 with a follow up of all cases for atleast 6 months. The total numbers of SCHF were 18. Of the total number, type II are 5 and type III are13.

Based on the Gartland's classification, 5 patients had Type II fracture and 13 of them had Type III fracture.

There were a total of 18 children operated for Supracondylar humerus fracture in this study. 14 were male and 4 were female children. Left elbow was more involved 14 patients i.e., 78% and right elbow in 4 patients i.e., 22%.

Table 2: Types of fracture

Type of fracture	Number of patients (%)
Type II	5 (28)
Type III	13 (72)
Total	18 (100)

Table 3: Sex distribution

Sex	Number of patients (%)
Male	14 (78)
Female	4 (22)
Total	18 (100)

Most of the injuries occurred during playing and fall from height i.e., 15 children. Remaining 3 are due to road traffic accidents. Out of the 13 cases,who had Type III fracture, 11 of them had posteromedial displacement and 2 of them had posterolateral displacement.

Preoperative injuries were seen in 3 patients, 1 patient had radial nerve injury and 1 patient had medial nerve injury. In all these cases, nerve functions improved by 6- 8 weeks. One patient had distal radius fracture, which improved following closed reduction and pinning.

Of the 18 cases, 11 patients underwent closed reduction, of which 5 belonged to Type II and 6 belonged to Type III fractures. All the 7 patients who underwent open reduction, had Type IIIfractures.

Table 4: Pinning method

Wiring	2-cross wire	2 lateral	3 K-wire	Total
	N (%)	N (%)	N (%)	N (%)
Type II	4 (22)	1 (5.5)	-	5 (27.8)
Type III	3 (16.5)	-	10 (56)	13(72.2)

Of the 18 cases, 7 of them underwent 2 cross wire pinning, 1 of them underwent lateral pinning and 10 of them underwent 3 K-wire pinning. Of the 5 patients who had type II fracture, 4 of them underwent 2 K-wire crossed pinning configuration and 1 of them underwent 2 lateral pinning configuration. Of the 13 patients, who had type III fracture, 10 of them underwent 3 K-wire pinning and 3 of them underwent 2 K-wire crossed pinning configuration

One of the patient developed pin tract infection, which was recognized by the presence of hypertrophic granulation tissue, which healed with antibiotic therapy and 1 patient developed cubitusvarus deformity of right hand, butmaintained good functional movement. During the study and during follow up, the problems of vascular injury, compartment syndrome, myositis ossificans and non- union were not of much concern.

Case series 1

Complications observed in our study

Fig 1 (A and B): Pre-op and post–op

Case series 2

Fig 2 (A and B): Pre-op and post-op

Table 5:Flynn's Criteria

Results/Rating	Cosmetic factor carrying angle loss(Degree)	Functional factor movement loss (Degree)
Excellent	0-5	0-5
Good	5-10	5-10
Fair	10-15	10-15
Poor	>15	>15

Table 6: Result

Results	Cosmetic	Functional
Excellent	83% (15)	77% (14)
Good	11% (2)	17% (3)
Fair	6% (1)	6% (1)
Poor	0%	0%

Discussion

Closed reduction and k wire fixation of supracondylar humerus fracture in children is a sound and effective technique especially for type 2 and type 3 fractures[5-8].The type 1 fractures are safely treated with immobilization in plaster of Paris. In total 18 patients who were fixed with k wires, excellent results in 83% patients, good results in 11% patients & fair results in 6% patients were obtained. Of the 18 cases, according to Flynn's criteria 77% patients had limitation of 0-5 degree, 17% patients had 5-10 degree, 6% patient had 10-15 degree and no patient had limitation of movement >15degree.

Deep pin tract infection was detected in 1 patient in which K wire was removed after 2 weeks.

Cubitusvarus deformities remain a common complication if it is not properly reduced. In other technique like open reduction and internal fixation the results are varied with incidence of varus deformity ranging from 3 to 30%. Persistent elbow stiffness after open reduction is also reported[9]. Percutaneous pinning after closed reduction has got an edge over other techniques. Immediate fixation of these fracturesreduces the hospital stay. This technique provide anatomic and stable fixation. This minimizes the risk of compartment syndrome and increases the circulation. K-wire fixation has its own rare disadvantages, complications like ulnar nerve injury, wire extrusion and pin tract infection and heterotrophic ossification have been reported[10-13].These complications have been reported in a very few cases of our study.Analysis of the Baumann angle loss did not show much difference between the 2 groups. The 3rd pin from lateral side in mediolateral group was not necessary and the fixation with medio-lateral and lateral fixation was stable. The loss of fixation was slightly more in number in 2 lateral pin fixation method. The Supracondylar humerus fracture is fixed in type 2 and 3 fractures which facilitates good stable fixation, early union and lessens the displacement of the distal fragment. This technique and k wire fixation is associated with good function and less morbidity, and children can freely move the shoulder and fingers. Good reduction and stable fixation is aimed for, in allcases.

Devakumaran advocated primary open reduction and K- wire fixation and obtained 93% excellent a 6.7% good results. He advised minimal tissue trauma, and early mobilisation for better results[14].

As compared to the study made by Devakumaran obtained 93% excellent results and 6.7% good results, in our study we obtained excellent results in 83% of cases and good results in 11% with percutaneous pinning.

Conclusion

The treatment of type 2 and 3 SCFH by closed reduction and percutaneous pin fixation has given consistently good results, compared to closed reduction and POP casting. With closed reduction and POP casting it is difficult to maintain reduction; whereas open reduction and k wire fixation and other method have risks of excess callus/myositis and deep infection of the wound which results in delay in starting the physiotherapy and getting a good range of movements. Adequate fixation is achieved with both lateral as well as crossed k wire fixation. 2 lateral K-wire fixation is found to be a relatively safe and easier method compared to crossed k-wire fixation. In crossed K-wire fixation iatrogenic ulnar nerve injuries are likely if due care is not taken. The pin fixation from lateral side has the advantage of avoiding ulnar nerve injury but the fixation may be relatively less stable and some authors reported that

mediolateral entry provides greater torsional rigidity than lateral entry method does. The main advantage and strength of this mediolateral fixation is the divergence of pins in different columns. The use of two pins laterally was preferred to reduce the risk of infection and to avoid ulnar nerve palsy. According to Skaggs et al the use of lateral-entry pins alone was effective for even the most unstable supracondylar humeral fractures[15].From the present study it could be concluded that closed reduction and percutaneous fixation is a sound and effective technique for treatment of displaced Supracondylar fractures in children.

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