

Original Research Article

Surgical Management of Highly Communitated Supracondylar Humerus Fracture in Children with Closed K-Wiring

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Abstract: Among all the fractures in upper limb in children, supracondylar fractures of the humerus are more common injuries. In general the fractures of children are treated conservatively. But the management of supracondylar fractures has evolved over years from conservative to more aggressive approach operative techniques. The study was conducted in children's presenting with highly committed supracondylar fractures to Adichunchanagiri Institute of Medical Sciences, B.G. Nagara between Jan 2014 to Dec 2016. Twenty of such fractures cases were selected in the study and underwent Closed Reduction And K-Wiring. Patients from 6-12 years were taken for the study. Patients were followed up every week X-rays were taken 4 weeks. The study consisted of 20 highly committed supracondylar fractures cases, among them were males and 3 were females. The patients were between the age of 6 to 12 years. Among them 16 children were in the age group of 6-10 years and 4 were in the age group of 10-12 years. Among the 20 cases 15 were Left sided and 5 were Right sided. All patients had achieved clinical and Radiological union at 4 weeks. According to Flynn's criteria, 19 (95%) cases had excellent results and one (5%) had good results. Closed reduction and K-wiring had very good results for highly committed supracondylar fractures of humerus in children than conservative/open reduction methods. With correct anatomical knowledge, perfect reduction and good operative skills closed reduction and K-wiring for paediatric highly committed supracondylar fractures has excellent results.

Keywords: Highly comminuted supracondylar fractures, K-wiring, Closed reduction

INTRODUCTION

Of all the fractures in the upper limb the supracondylar fracture of the humerus in children is not only the most common injury but results in serious complications if not treated appropriately. In general, fractures in children are treated conservatively. Surgical treatment is reserved for some physeal injuries, fractures associated with neurovascular compromise, open fractures and certain special circumstances like fractures around hip. The management of supra condylar fractures of humerus has evolved from a purely conservative approach to a more aggressive approach in recent years. Supra condylar fractures need a precise treatment in order to obtain a satisfactory result because of low bone remodeling associated with these injuries. It is important to use a systematic procedure for acceptable outcome [1].

Displaced and Communitated supracondylar fractures of humerus have always presented a challenge in their management [2]. Many methods have been

proposed ranging from closed reduction and plaster cast immobilization, Dunlop's skin traction, skeletal traction, closed reduction and percutaneous pinning to open reduction and Kirschner wire fixation [3-5]. Treatment of this displaced fracture is fraught with many complications including Volkmann's ischemic contracture, nerve injury, arterial injury, myositis - ossificans and cubitus varus deformity [6, 7]. Extension type fractures, which accounts for approximately 97-99% of supra condylar humeral fractures are usually due to fall on the out stretched hand with elbow in full in extension and management of undisplaced fractures is usually conservative, but the management of the completely displaced fracture is controversial.

OBJECTIVES:

1. To study functional outcome after closed reduction and K-wiring of type III (Gartland classification) highly Communitated supracondylar fracture humerus in children.

2. Accuracy of reduction and its radiological evaluation by Baumann's angle.
3. To find out final range of movements of the elbow joint in terms of flexion and extension.
4. To analyze the end results of surgery with respect to bony union.

METHODOLOGY:

It is a study of surgical management of highly Communitated supracondylar fractures treated by closed reduction and K-wiring in children 6-12years in Adichunchanagiri Institute of Medical Sciences, B.G. Nagar. All highly Communitated supracondylar fractures were screened selected accordingly. Patient was positioned in supine position on the operation table under general anesthesia. Under c-arm flourosopic guidance, closed reduction and K-wiring with 1.6 to 2mm were put. Two K-wires were put Criss-cross from each epicondyle, opposite cortex crossed after crossing the fracure site. The Fracture reduction and firm fixation were confirmed with AP and lateral views under c-arm.

SOURCE OF DATA:

The patients admitted to the orthopedic department at Adichunchanagiri Institute of Medical Sciences, B.G. Nagar with supracondylar fractures during the period of Jan 2014 to Dec 2016 were selected. A sample size 20 patients operated during this period will be considered.

RESULTS:

Twenty cases taken for this study have been categorizes according to the age, sex, side of the limb. In twenty cases, 17(85%) were boys and 3(15%) were girls. Age group distribution was 16(80%) in the age group 6-10years and 4(20%) in the age group 10-15years. The Left (15; 75%) supracondylar fractures were more common than Right (5; 25%). All cases were operated using closed reduction and K-wiring under c-arm guidance. Out 20cases, one had pin site infection which healed after k wires removal. one more case had elbow stiffness which improved with physiotherapy.

All the 20cases taken showed union within 4 weeks. Out of 20cases 19 had excellent results.

DISCUSSION:

The study was conducted to know the outcome of highly Communitated supracondylar fractures of humerus in children operated with closed reduction and K-wiring under c-arm guidance.

The observations of the present study were evaluated and compared with previous studies and analysis was as follows:

1) Age distribution:

The highly Communitated supracondylar fractures of the humerus are commonly seen in children. The minimum age was 6years and maximum age was 11.5years. The average age was 8.1years, with most of the children being in the age group of 5-10(16cases-80%) and remaining in the age group of 10-15 years (4cases-20%).

2) Sex distribution:

There was male preponderance in the present study with 17(85%) males and 3(15%) females. The observations were similar to other studies.

3) Side affected:

Out of 20 patients taken for present study 15(75%) were Left and 5(25%) cases were Right supracondylar fractures. This shows higher preponderance in Left than Right side.

The majority of the fracures were sustained due to fall from height (13cases-65%).

4) Preoperative complications:

Two cases had superficial wound preoperatively over the operative site.2 cases had upper respiratory infections due to which surgery was delayed.

5) Postoperative complications:

Out 20 cases taken for the study one patient had pin site infection (the patient had previous wound over the operative site). One patient had stiffness of the elbow due to non-compliance of the child. Vigorous physiotherapy, Patient and parents counseling was done. Movements improved later.

6) Fracture union:

Out of 20 cases all went for good clinical and bony union. The average time of Fracture union was 4weeks.

7) Follow up protocol:

Patients were followed up every week. Postoperative x-rays taken 4weeks.Fractures showed good union by 4 weeks and K-wires were removed. Later children were instituted with active movements till a week. If children didn't have good range of motion, Patient advised physiotherapy and reviewed regularly. In our study,19 cases had very good and complete range of motion.

Flynn's criteria:

	Cosmetic factor carrying-angle loss(degrees)	Functional factor movement loss(degrees)
Excellent	0 to 5°	0 to 5°
Good	5 to 10°	5 to 10°
Fair	10 to 15°	10 to 15°
Poor	>15°	>15°

Statistical method: chi square test

In our study 19 cases had excellent results with full range of motion and less than 5 degree change in the carrying angle. one case had good result (5%) due to reduced range of motion.

In a study by D'Ambrosia R.D normal elbow motion resulted following each method of closed treatment but open reduction caused some loss in extension. Overhead threaded pin traction was safe and the swelling of the elbow rapidly decreased as gravity hastened venous and lymphatic drainage. Overhead pin traction prevented residual varus deformity possibly because it provided a position of mild pronation of the forearm. Closed reduction followed by a collar and Cuff also prevented residual varus deformity, possibly because of the neutral or pronated position of the forearm. In their opinion supinated position of the forearm should be avoided in the treatment of supracondylar fractures of the elbow in children [8].

In a study by Flynn J.C., Matthews J.G., Benoit R.L, Percutaneous pinning after closed reduction of supracondylar fractures has got several advantages. Immediate fixation of these fractures reduces the duration of hospital stay. If the fracture is fixed immediately after closed reduction it can be splinted in a safe position without any fear of loss of reduction. This minimizes the risk of compartment syndrome and maximizes circulation [9]. In a study conducted by NY OTSUKA, they concluded that the treatment of type II and type III (Gartland's classification) supracondylar fractures of the humerus in children with closed reduction and percutaneous pinning has dramatically lowered the rate of complications from the injury. The incidence rates of malunion (cubitus Varus) and compartment syndrome have both decreased [10].

In a study by Mazda K. *et al.* a prospective study reported the results of 116 consecutive displaced extension supracondylar fractures of the elbow in children treated during the first two years after the introduction of the following protocol; closed reduction under general anesthesia with fluoroscopic control and lateral percutaneous pinning using two parallel pins or, when closed reduction failed, open reduction and internal fixation by cross-pinning. The protocol described resulted in good or excellent results in 96% of our patients, providing a safe and efficient treatment for displaced supracondylar fractures of the humerus even in less experienced hands [5].

In a study conducted by Rijal KA, in their study concluded that percutaneous crossed K – wire pinning after closed manipulation in supracondylar extension type III fracture of the humerus is a reliable and safe method of treatment and is recommended in all [11]. In a study conducted by Sibinski M *et al.*

examined differences in the rate of open reduction, operating time, length of hospital stay and outcome between two groups of children with displaced supracondylar fractures of the humerus who underwent surgery either within 12 hours of the injury or later. The study confirmed that the treatment of uncomplicated displaced supracondylar fractures of the humerus can be early or delayed. In these circumstances operations at night can be avoided [12].

In a study conducted by Walmsley PJ *et al.* examined whether the timing of surgery affected peri-operative complications, or the need for open reduction. There were no differences in the rate of complications between the groups, but children waiting more than eight hours for reduction were more likely to undergo an open reduction and there was a weak correlation between delay in surgery and length of operating time [13].

In a study by Lee HY use dof pin leverage in the reduction of Gartland type III supracondylar fractures of the humerus in children, lead us to pin leverage method of reduction gives good results in the treatment of Gartland type III fractures [14].

In a study conducted by Devkota P *et al.*; found that closed reduction and percutaneous K – wire pinning in the management of supracondylar fractures of humerus in children is safe as regards avoidance of vascular complications, effective in obtaining good results and relatively economical regarding hospitalization. The disadvantage is the need for proficiency and the availability of C – arm fluoroscopy [16].

In a study by Lewis E. Zions *et al.* Time of Return of Elbow Motion after Percutaneous Pinning of Pediatric Supracondylar Humerus Fractures, observed loss of motion of 45° by 6 weeks and 22° by 12 weeks postoperatively, but there was substantial improvement with subsequent followup. After closed reduction and percutaneous pinning of a displaced, uncomplicated, extension-type supracondylar humerus fracture, 94% of the child's normal elbow ROM should be expected by 6 months after pinning. Additional improvement may be anticipated to occur as much as 1 year after the injury [17].

In a study conducted by Haque MR *et al* found that open reduction and internal fixation by K – wire is an excellent method of management of supracondylar fractures of humerus in children when the reduction could not be achieved by closed means [18]. In a study conducted by Babal JC, Mehlman CT, Klein G, they found that medial pinning carries the greater overall risk of nerve injury as compared with lateral – only pinning and that the ulnar nerve is at risk of injury in medially

pinned patients [19]. In a study conducted by Sial NA, Yasin A, Rashid A, in their study concluded that open reduction and crossed pin fixation is a sound and effective modality for the treatment of displaced supracondylar fractures with the advantages of decreased duration of hospital stay, anatomical reduction, stable fixation and early mobilization [20].

In a study by Sanglim Lee *et al.* Consensus and Different Perspectives on Treatment of Supracondylar Fractures of the Humerus in Children, Ninety-six percent of the orthopedic surgeons agreed that closed reduction and percutaneous pinning was the treatment of choice for the displaced supracondylar fracture of the humerus in children. They showed significant difference in the choice of pin entry (lateral vs. crossed pinning) between the three groups of orthopedic surgeons, but no significant difference was found in the number of pins, all favoring 2 pins over 3 pins. Most of the orthopedic surgeons used a removable splint during the ROM exercise period. Pediatric orthopedic surgeons and general orthopedic surgeons acknowledged that the patient's age was the most contributing factor to the restoration of elbow motion, whereas hand surgeons acknowledged the amount of injury to be the most contributing factor.

CONCLUSION:

The study was conducted to show the results of surgical management of highly Communitied supracondylar fracture in children with closed reduction and K-wiring. Supracondylar fractures of humerus are common in children. With highly Communitied supracondylar being more with high force like fall from height (13cases-65%) being the most common mode of injury. Fractures were more common in the age group of 6-10 years (16cases-80%) and average age was 8.1years. Males were more commonly affected than female (17males-85%, 3females-15%). Range of motion and carrying angle were good in 19 cases (95%). Closed reduction and K-wiring is a better modality for highly Communitied supracondylar fractures in children. It avoids stiffness of elbow, delayed soft tissue healing as compared to conservative/open methods. The postoperative complications were pinsite infection (one case) and only one case of reduced elbow motion at the extreme range due to non-compliance. With correct anatomical knowledge, good reduction, strict adherence to AO principles and operative skills closed reduction and K-wiring for highly Communitied supracondylar fractures is the better method of fixation.

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