

Outcome of Lateral Approach for Displaced Supracondylar Humerus Fractures in Children

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ABSTRACT

Supracondylar fracture of humerus in children make approximately 65% of all fractures and dislocations and elbow. These fractures occur between 5 to 8 years age, usually on the left side and in boys. Treatment of these fractures is controversial and complications are common. More of the treatment vary from close reduction + plaster immobilization, close reduction + percutaneous K wires fixation and Open reduction + K wires fixation through medial, posterior and lateral approaches. This quasi randomized control trial is performed at department of Orthopaedic and spinal surgery Ghurki Trust Teaching Hospital Jallo More, Lahore to determine the outcome of lateral approach and to observe any pre-op or post-op complication in six months. Patients 2 -10 years of age, of both sexes were admitted through A &E department. The study comprises of 50 patients. Patients were followed in OPD at three weeks, five weeks, six weeks, seven weeks, nine weeks and three months. On each visit radiological and functional assessment was recorded. Functional outcome is better in patients with open reduction and K wire fixation through open reduction by lateral approach. The cosmetic results are good, these results are compatible to results in international studies.

Keywords: Closed reduction and percutaneous pinning, open reduction K wire fixation,

INTRODUCTION

Supracondylar fracture are commonest and most frequently occur below the age of 10 years. These usually occur on the left and in boys. Supracondylar fracture are caused by accidental trauma, usually fall on the out stretched hand from height from bed, furniture, from monkey bars and swings¹.

Supracondylar fracture are either extension type 97% or flexion type 3%. Extension type fractures are further classified by willkin's (modified Gartland's) into type I, II & III. Type I fracture are un-displaced and type II fractures are displaced but with intact posterior cortex. Type III fractures are displaced but with no cortical contact^{1,2,3}.

The child usually presents with elbow pain or failure to use the upper extremity after fall and may be associated with the neurovascular injuries or deformities^{4,5}. The incidence neurological injuries ranges from 5 – 19%, most of the injuries are neuropraxias. Vascular injuries have been reported to be 5 – 12%, examination of extremity requires the assessment and recording of neurovascular status^{4,5,6,7}. Radiological assessment includes X-ray's of the involved elbow both A-P and lateral views. Special consideration is given to the type of fractures, degree of displacement, carrying angle, Baumann angle, humerotrochlear angle and medial epicondylar epiphyseal angle^{8,9,10,11,12}.

Supracondylar fracture can be managed by closed reduction and immobilization in plaster slab but ideally these fractures are managed by closed reduction and K-wire fixation which advocated by Jones and Sewenson and popularize by Flynn and Wilkin's^{13,14}. If these measures fail open reduction is considered to reduce these fractures through lateral, medial, anterior and posterior approaches with two cross K-wires of 1.5 mm in size. Every approach has its advantages i.e., lateral approach includes simplicity of exposure without any dissection of important neurovascular structures^{15,16,17,18}.

In our department we use lateral approach for treating type III supracondylar fractures, as it is safe and fractures reduction is excellent. Keeping in view of these benefits I decided to conduct the study on the outcome lateral approach. The objectives of this study was to determine the outcome of lateral approach for displaced supracondylar fractures of the humerus in children (2 to 10 years age) and to identify any per-operative and post-operative complications. Where lateral approach means skin incision on the lateral aspect of the elbow, splitting of underline subcutaneous tissue and muscles, exposure of fracture site and fixation with 2 cross k-wires. The outcome measured in terms of range of motion as good, average, poor in degrees, radiological bone healing as good, average, poor callus, carrying angle:($7^{\circ} \pm 4^{\circ}$), and Baumann angle (64° to 81°). We look for per operative complications like ulnar nerve injury or vascular injury and post operative complications like loss of reduction,

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angulation at fracture site like varus, valgus, Pin tract infections, malunion, stiff elbow and Volkmann's ischaemic contracture.

MATERIALS AND METHODS

This descriptive study was performed at department of Orthopedics & Spinal Surgery, Ghurki Trust Teaching Hospital, Lahore Medical & Dental College Lahore from 18-08-2006 but extended to 30th March 2007 for proper follow-up. Fifty cases of displaced supracondylar fractures of the humerus (Gartland type III) in children between two to ten years age who reported within 48 hours after injury and selected for open reduction internal fixation with k wire was collected by convenience non-probability sampling. Open fractures, pathological fractures, supracondylar with humeral shaft fractures and poly trauma patients were excluded from the study.

Written informed consent, demographic information, history, examination and investigations will be taken. All fractures will be reduced in the emergency and back slab will be given. Patients admitted in the ward and operated on the same day or on next elective list.

Our operative technique was that on the same day or on next elective list patient were taken to theatre. General anaesthesia was given. The affected side is properly prepped with pyodine solution after application of tourniquet and inflation of that to 250mmhg.

Second generation cephalosporin was given preoperatively. The patient was draped appropriately after preparing site. Then the fracture was reached through the lateral approach and reduced. Then fracture reduction was conformed under fluoroscope and any medial or lateral displacement corrected. Then 1.5-2mm k-wires was passed first into the lateral side. The direction of entry was 10° posterior and 40° from distal to proximal direction. During insertion of pin, its position was continuously monitored under fluoroscopic guidance reduction again confirmed and medial pin was passed. The direction of medial pin was anterior-posterior and from distal to proximal manner. The medial pin was inserted in similar manner as the lateral pin. Ulnar nerve was carefully protected to prevent iatrogenic injury to it. The position was checked under image intensifier / fluoroscope. The far cortices engagement was also conformed. The k-wire were bent and cut just out of skin.

Muscle and subcutaneous tissues were closed with vicryl 2/0 after wound irrigation, haemeostasis. Skin closed with prolene 2/0 or 3/0. antiseptic dressing was done and long arm back splint was given in 90° flexion at elbow.

Patient after operation were shifted to the ward and kept NPO for next 6 hours. I/V fluids, 2nd generation cephalosporin and analgesia started. The affected limb elevated to reduce swelling. Observation for neurovascular was done properly. Post-op check x-rays was done and reduction reconfirmed on post-op day. Suction of suction bottles was also checked and maintained if out of order. Suction during was removed on the 2nd post-op day and wound examined. Patients were discharged on the 3rd or 4th post-op day. Follow up plans in the clinic were also explained carefully to these patients.

Patients were checked in the clinic after 10 days of discharge, X- ray done to confirm the position of reduction and examination of wound, stitches were removed. Back splint again reapplied. After this the patient is called on 3rd week X-ray is taken to see the attempt of bone healing, range of motion. Back splint was removed. The patient advised range of motion exercises. On 5th week X-ray is were taken to see the attempt of bone healing, range of motion and carrying angle was also checked with the help of goniometre. On 6th week carrying angle was also checked with the help of goniometre, on 7th week X-ray is were taken to assess the range of motion and callus formation, on 9th week X-ray is were taken to assess the range of motion and callus formation, and then at 3 months carrying angle was also checked with the help of goniometre. During all visits nerves, other complications were properly assess and recorded.

The collected data was transferred and analysed accordingly using SPSS Version 11.0. The variables to be analysed will include demographic information, range of motion, radiological bone healing, carrying angle. The grading of carrying angle and range of motion will be done according to Flynn grading system. These variables will be analysed by using simple descriptive statistics, using mean and standard deviation for quantitative data e.g., age and frequency, percentage for qualitative data e.g., range of motion, carrying angle. Specific variables will be associated with general variables, if any association found that will be analysed by using Chi-square tests as the data mainly will be qualitative in nature. P value ≤ 0.05 will be taken as significant.

RESULTS

The study sample consisted of 50 patients. The mean age for the sample was 6.46 years. (Mean \pm SD=6.46 \pm 2.32). Out of 50 patients, 10 patients (20%) were between 2–4 years of age, 22 patients (44%) were in age group of 5 – 7 years and 18 (36%) patients were above 7 years . 36 patients (72%) were males and 14 (28%) belongs to female gender. Majority of the patients 29(58%) were

presented by H/O fall from height, 14 patients (28%) presented with injury during playing and 7(14%) patients with RTA. The side involve was left in 38(76%) of patients and right in 12 (24%). Main bulk about 36 patients (72%) of the patients belonged to middle class and 12 patients (24%) belonged to lower class. Only one (2%) of the patients belong to poor class. The duration of injury varied from 2 - >40 hrs. In 18 patients (36%) the duration of injury was 2 – 10 hrs. In 11 patients (22%) the duration was 11 – 20 hrs. while in next 20 patients (40%) it ranges 21 – 30 hrs. Only one patient (2%) presented with more than

40 hrs. The range of motion in 1st 17 patients (34%) was 146° and in the last 2 patients (4%) it was 142°. 4 patients (8%) developed radial nerve injury because of tourniquet which improved with time and treatment. Bone healing assessed radiological showed good callus formation in 43 patients (86%) and poor in only 7 patients (14%). Comparison of the carrying angle loss and functional factors was monitored according to Flynn grading system. It shows P values of 0.001 and 0.005 which match international studies.

Table 1: Comparison between carrying angle loss and functional factor of patients according to criteria of Flynn grading

Rating	Carrying angle	Functional factor	Chi-square	P value
Satisfactory				
Excellent	10	35	23.08	0.001
Good	26	15	8.00	0.005
Fair	14	-	-	-
Unsatisfactory				
Poor	-	-	-	-

DISCUSSION

Below 10 years of age supracondylar fractures of the Humerus in children are the commonest fractures. Different surgeons use various methods to treat these fractures^{1,3}.

The average age in this study was about 6.46 years which coincides with the international literature. The common mode of patient presentation was fall from height followed by injury during playing and RTA. This site of injury was explained by ligamentous laxity and weakness of the Supracondylar area of the Humerus^{3,5,9}. This pattern of injury is also verified by Gartland’s classification in displaced fractures. FOOSH, (fall on outstretched hand) was the mechanism usually observed. These fractures are most common in boys which is also proved by literature. Duration of injury commonly was within 0 – 48 hrs.

Different techniques of fracture reduction are use by different people. In the accident and emergency fractures are reduced under sedation or I/V analgesia or under G/A and back slab is applied for immobilization these patients require re-operation because of loss of reduction which may produce physical and psychological trauma to these patients. The advantage in this procedure is low complication rate.

Traction in extension with braces due to ease of application in maintenance is also in use. In these cases there are risks of poor compliance, chance of malunion, lengthy hospital stay and stiffness of elbow. These disadvantages prove this method as an ineffective method of treatment.

Gradual traction (skeletal or skin) was use in some studies, when patient presents late. Initially the elbow is kept straight and forearm in comfortable position. These fixed with K-wire or with plaster immobilization is under taken. These studies show lengthy hospital stay, malunion, stiff elbow and poor compliance.

In closed reduction and percutaneous pin fixation under image intensifier, fractures are reduce and fixed with K-wires after confirmation of reduction. This reduction needs fluoroscope and without this reduction and K-wire fixation are impossible. The advantages of C.R.P.P. are less time consumption in expert hands, minimal scar and less infection and short hospital stay¹³.

In some studies only 2 lateral pins are use for fixation of fracture fragments in displaced supracondylar fractures in children. The surgeon using this technique claim that this is prophylactic for ulnar nerve injury prevention, which can occur in cross K-wire fixation of these fractures. Small medial incisions are also used for identification of ulnar nerve before insertion of medial pin. This may be helpful to prevent iatrogenic ulnar nerve injury^{19,20}.

Ilizarov external fixation is used by some surgeons to treat displaced supracondylar humeral fractures in children. This technique require experienced surgeon and this may result in neurovascular injury. The rate of infection is also high with Ilizarov external fixation which is proved by studies²¹.

Different approaches are used for open reduction and internal fixation of displaced Supracondylar humeral fractures i.e., lateral, medial,

posterior, anterior cubital depending on type of fracture and recommendations of literature.

In our study we use lateral approach to fix the Gartland type III Supracondylar fractures of the Humerus with two 1.5mm cross K-wires. The advantages of this approach are that easiness, safe and low complications rate. It is proved by literature.

In open reduction and internal fixation with cross K-wires there are chances of loss of flexion and extension lag. In our study however this is easily overcome by physiotherapy and good to excellent result are achieved⁶.

Functional outcome according to Flynn's criteria is usually good to average in open reduction and internal fixation of displaced supracondylar humeral fractures in children usually. In our study these are good to excellent. This approach has also the advantage that fractures can be fixed without fluoroscope²²⁻²⁵.

Result of my study are comparable to other international studies. Closed reduction v/s open reduction in our setup is debatable because of lack of available fluoroscopic facilities availability.

CONCLUSION

No doubt C.R.P.P. is the ideal treatment modality for type III supracondylar fractures of the Humerus in children. In our country where there is limited availability of fluoroscopes lateral approach for reduction of fractures in my view is the best solution. This approach is easy and safe. The neurological complications using this approach are few and can be prevented by careful insertion of pin. Functional and cosmetic results are also good to excellent.

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