



## Closed Reduction and Internal Fixation With Kirschner Wires For Supracondylar Fracture Humerus in Children

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### ABSTRACT

**Background:-** Supracondylar fracture of humerus is the commonest injury around elbow in children. The supracondylar fracture of humerus demand great respect in treatment because if it is not treated properly it may give rise to many complications. **Material methods :-** Twenty closed extension type of supracondylar fractures (Gartland's type III) of the humerus were treated by close reduction and internal fixation with K-wires between September 2012 to August 2014 at peoples college of medical sciences and research centre bhopal. **Results:-** Total 14 patients (70%) presented with involvement of left side and 6 patients (30%) on the right side. The overall results at the end of one year are as follows: Good (60%), Fair (30%) and Poor (10%) All our patients were discharged from the hospital on an average after 7 days. **Conclusion:-** Closed reduction with percutaneous pin fixation provides an accurate, stable reduction, is easy to perform and had found to give consistently good results. In a country where the hospitalization costs are high, and the wards are congested, operative treatment of these fractures allows a rapid patient turn over. This is of great economic significance to a developing country such as ours.

### KEYWORDS

K-wire, humerus, internal fixation, Supracondylar fracture.

### Introduction

Supracondylar fracture of humerus is the commonest injury around elbow in children. It constitutes about 65.4% of all the fractures about the elbow in children. The occurrence rate increases progressively in the first 5 years of life to peak between 5-7 years of age.<sup>1</sup> The supracondylar fracture of humerus demand great respect in treatment because if it is not treated properly it may give rise to many complications such as Volkman's ischemic contracture, neurovascular injury, myositis ossificans, stiffness of elbow and malunion.<sup>2</sup> It needs accurate anatomical reduction and internal fixation. So, no longer is it acceptable to near 'not bad for a supracondylar fracture'.<sup>3</sup> Supracondylar fractures involves the lower end of the humerus usually involving the thin portion of the humerus through olecranon fossa, or just above the fossa or through the metaphysis. It is general belief that accurate reduction in children is not essential for a good result, because growth may correct a deformity. It is true that functional end results of mal alignment are generally very good but is also true, the cosmetic end results are very poor. Stiffness of the elbow which sometimes follows relatively minor injuries, remarkable sensitivity of the injured joint and too early passive movement adds to the difficulties of treatment and prognosis. Recurrence of displacement occurs in spite of accurate closed reduction and immobilization in flexion. These injuries of elbow demand respect because, their vascular damage and nerve injury they cause than any other injuries in the body.<sup>2</sup> There is no controversy regarding management of undisplaced and partially displaced fracture but the treatment of a completely displaced fracture is not one but many. Others have devised blind pinning after reduction or pinning under x-ray control. Some even advocate to the extent to accept an unsatisfactory closed reduction, perform an osteotomy to correct the deformity at a later stage. In the region of the elbow, however, there are often more indications for aggressive treatment, including operative management. No longer has it held to say "NOT BAD FOR A SUPRACONDYLAR FRACTURE." With this background the present study is conducted to evaluate the results of supracondylar fractures treated

by closed reduction and percutaneous K wire fixation under C-arm guidance.

### Methodology

Twenty closed extension type of supracondylar fractures (Gartland's type III) of the humerus were treated by close reduction and internal fixation with K-wires between September 2012 to August 2014. The study was conducted in peoples college of medical sciences and research centre Bhanpur Bhopal. Inclusion Criteria i Age 15 years. ii Patients medically unfit for surgery. The ethical clearance for this study was taken from the institution. All patients selected for this study were admitted peoples college of medical sciences and research centre bhopal and examined according to protocol and associated injuries if any were noted. X-rays were taken in two planes. A trial closed reduction was done in 27 patients and three patients who had gross swelling, were taken for elective surgery at the earliest without closed reduction. All fractures were classified according to Gartland's classification chart: Type I - Nondisplaced Type II - Displaced (with intact posterior cortex) Type III - Displaced (no cortical contact)

### Operative Procedure

Closed reduction and percutaneous pin fixation with criss-cross Kirschner wires, under C-arm guidance. Under General Anesthesia, position was supine. Technique: - the elbow was prepared and draped. The posterior triangle of the elbow was outlined. The fracture was reduced by applying longitudinal traction; extending the fracture; and manipulating with thumbs to correct the lateral tilt, medial impaction, or posterior displacement. The elbow was flexed from neutral. Antero posterior and lateral reduction images were checked with aid of image intensifier. A 1.5mm K-wire was mounted over a power drill. The K wire was passed from the medial epicondylar ridge obliquely across the fracture site to engage the opposite cortex. The medial pin was angled 40 degrees from the axis of the humeral shaft and 10 degrees posteriorly, avoiding the ulnar nerve. In a similar fashion, another 1.5mm K wire was passed from the

lateral epicondyle obliquely across the fracture site to engage the opposite cortex. The pins were cut off beneath the skin and bent. Radial pulse was noted. K wire placement. The reduction & stability of fracture was checked and the movements of the elbow verified both clinically and under C-arm guidance on the table. In the coronal plane, the wires travel up each S.C. Column, with wide separation at the fracture site. This provides the most rigid biomechanical construct.

### Post Operative Management

A long arm posterior splint applied and limb was elevated. Antibiotics and analgesics were given. Ulnar, Radial and Median nerve were checked after anesthesia. A check X-ray was taken on the second day. The patient was advised to do active finger movements and discharged at proper time. Patient was asked to review after 3 wk in out patient department and inspection done. Operated site was inspected for: a) swelling, b) extrusion of pins, c) pin tract infection if any d) stretch pain. Dressing done and splint removed.

### Follow up

Patients were advised immediately to do active movements of the elbow, both flexion and extension, and finger movements, without lifting any weight on the operated limb. The 3 cases that had neuropraxia were followed up for status of the neurological deficit. Power of extensors was checked in radial nerve involvement; opposition of fingers was checked in median nerve involvement. Check x-ray was taken to see whether union was in progress. The pins were removed when radiological callus was seen on the x-ray, after 4-6 weeks of fixation. After removal of the pin, patient advised to continue active exercises of elbow and fingers as advised soon after the surgery. They were advised to come once in 4 weeks to assess the range of the elbow movements and rate of fracture. They were then called at 3 months following surgery. X-rays were taken to assess the rate of union, Baumann's angle and carrying angle was assessed. Patients who were having neurological involvement were followed up 2 times weekly following surgery. Later follow-ups were made at six months. The ranges of movements were measured using a goniometer at these intervals. X-rays were taken to assess radiological union.

### Statistical analysis

The data was entered in Microsoft office excel 2007. The data was analyzed using Epi-info software. The continuous variable was analyzed as mean and standard deviation while categorical data as percentage and proportion.

### Result

A detailed history of the mode of injury was obtained from the parents as well as the patient. There were 16 boys (80%) and 4 girls (20%) with average age of 7.2 years. 14 patients (70%) presented with involvement of left side and 6 patients (30%) on the right side. No case sustained fracture due to a fall on a flexed elbow and all 20 cases fell on outstretched hand. Out of the 20 cases, 8 (40%) sustained fracture due to a fall while playing and the remaining 12 (60%) patients due to fall from cycle. All most all the cases had history of fall on outstretched hand. All patients presented with pain, swelling, S-shaped deformity of the lower arm and inability to move the affected elbow. On examination, all patients had diffuse swelling around the elbow. Puckering of the skin was seen at the site of fracture in 4 cases. 2 patients had fracture blebs and presented after 2 days. All the patients had shortening of the arm as compared to the normal side. The average period from injury to presentation was 10 hours. 6 cases gave history of have received massage from an osteopath.

### Associated injuries included

2 cases of postero lateral displacement and 1 case of posterior. All displacement were accompanied with median nerve injury. 1 case of postero-medial displacement was accompanied with radial nerve injury. These were traumatic neuropraxias and recovered completely in 10-12 weeks. Vascular injury: In 3 patients, the radial pulse was feeble. Of these, 2

patients presented with diffuse swelling of the affected limb and 1 patient had a tight bandage around the arm extending to the forearm, which was applied by an osteopath. No patient had stretch pain. The patients were able to move their fingers feebly and the character of the pulse became normal after closed reduction percutaneous pin fixation with K wires. X-ray of the elbow was taken in two planes, antero-posterior and lateral. 20 cases of Gartland's grade III type of supracondylar fractures were included in this series. These were further grouped into fractures with postero medial, postero lateral and posterior displacement. Out of these 20 cases, 6 had posterior-medial, 12 had postero lateral, 2 had posterior displacement and there was no case of flexion type. Flexion types of S.C. fractures are much less common than the extension types, with a reported frequency ranging from less than 1% to 10% of S.C. fractures. Complications were encountered like: Feeble radial pulse in 3 cases, before reduction. There were due to diffuse swelling at time of presentation and tight bandage as applied by osteopath. The pulse had returned immediately after reduction. Three cases of median nerve and one case of radial nerve involvement were noted pre operatively which were transient and recovered spontaneously over the period of 10 to 12 weeks. Pin tract entry wound irritation was seen in 2 of the cases which presented as points of hypergranulation tissue on the skin. This could have been avoided by burying the K-wires subcutaneously. 2 cases of pin tract infections, which subsided immediately after appropriate antibiotic cover and dressings. These minor complications like pin tract entry wound irritation and pin tract infection had no influence what so ever on the final functional result. There was not a single case of secondary nerve lesion of Volkmann's ischaemia or myositis ossificans. The overall results at the end of one year are as follows: Good (60%), Fair (30%) and Poor (10%) All our patients were discharged from the hospital on an average after 7 days.

### Discussion

Supracondylar fractures of the humerus in children are common injuries and complete displacement of the fragments occurs in many of the cases. Vascular complication is preventable to a great extent. However, cubitus varus deformity seems to be the most common complication with any of the methods of treatment. In 1939, John Dunlop in his observation, noted "transcondylar or a bicondylar" fracture of the humerus offered the most important stumbling block to reduction, not because the fragments cannot be brought end to end, but because of a difficulty in maintaining the reduction. It was observed that upper and lower fragment became rotated in their relation to each other. The fracture surface at that particular level consists of an extremely narrow edge rarely more than 4-5mm. The many so called reductions were obtained by "rotation of the fragments" resulting in their locking. When such a reduction was obtained, deformity was a sure outcome. Indeed these observations were collaborated by Mitchell and Adams. In 1960, 38 of the 83 patients had a varus deformity following treatment. 60% of those of the above 38 who showed a varus deformity were treated by manipulative reduction and immobilization and 18% of those 38 patients who were treated by Dunlop's traction, exhibited such a deformity.<sup>4</sup> Skeletal traction is the only method besides surgery, which can prevent the error of internal or rarely external rotation that persists after manipulative reduction or even skin traction. This however requires precision management of the traction system and confines the child to the bed. In the present series, all the patients have been followed up for a period of a 6 months, some patients more than 1 yr. 6 patients were in addition subjected to local massage by an osteopath according to the history, but clinic -radiologically showed no evidence of myositis ossificans. The considerable soft tissue oedema is an expression of the underlying injury and its severity, and it indicates a regional vascular compromise. Immediate exploration in these cases achieves good soft tissue decompression, allows ease of reduction and as a result of anatomic restoration of the span of soft tissue, the progression of oedema was arrested.

The results presented by us compare well with the results observed by other authors in literature.<sup>5-9</sup> These results are better than equivalent results in series, both for the change of carrying angle is concerned as well as the motion of the elbow is considered. Closed reduction with percutaneous pin fixation of displaced supracondylar fractures in children is based on the principles of treatment of intra articular fractures namely, anatomic restoration, stable internal fixation and early mobilization.<sup>10</sup> The underlying philosophy encompasses the mechanical understanding of the distal end of the humerus and should be applied to displaced fractures where in accurate alignment of the fracture ends is difficult to maintain and rotational malunion may jeopardize the end results. The results of closed reduction with percutaneous pin fixation are therefore predictable and good if early anatomic restoration is carried out. This eliminates the inaccuracies of conservative management which may be imprecise and cumbersome for the patient. Conservative treatment necessitates hospitalization of the patient and demands supervision of the patient constantly. Closed reduction and percutaneous pin fixation of supracondylar fractures is a safe and effective procedure, for which one should lower their threshold regarding its indication. However, clinical findings that suggest vascular injury warrant a more aggressive approach by surgical exploration especially to avoid the dreaded complication of Volkmann's Ischaemic Contracture. Traumatic neuropraxia of one or more of the three adjacent peripheral nerves is a common complication of displaced supracondylar fractures, with a great majority of these lesions responding to conservative treatment. The major complication of surgical management appears to be a loss of range of motion. The main reason for decrease in range of motion was delay in active exercises. Most patients will regain full function of the elbow if the K wires are removed following callus formation in x ray and motion started 4 weeks after injury- Early motion is the key. The other complication is residual cubitus varus deformity which is mainly due to inadequate reduction as a result of medial pillar comminution. The complication can be avoided by keeping the implant in situ till the X ray shows callus formation.

### Conclusion

Closed reduction with percutaneous pin fixation provides an accurate, stable reduction, is easy to perform and had found to give consistently good results. In a country where the hospitalization costs are high, and the wards are congested, operative treatment of these fractures allows a rapid patient turn over. This is of great economic significance to a developing country such as ours. We strongly advocate closed reduction of displaced supracondylar fractures of the humerus in children with percutaneous pin fixation with K wires for the various reasons discussed above in the study.

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