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OPEN REDUCTION PERCUTANEOUS K-WIRE FIXATION OF DISPLACED SUPRACONDYLAR FRACTURES OF HUMERUS IN CHILDREN

Orthopaedics

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ABSTRACT

In our clinical study ten cases of displaced Supracondylar fractures of humerus in children of 3 to 14 years age group were included after judgment sampling during NOV'2013 to FEB'2015. As these fractures present with severe swelling around elbow and impending injury to neurovascular structures at elbow, the main objective is to avoid dreaded complications like VIC, injury to nerves, myositis ossificans or rotational deformities like cubitus varus or valgus through proper management by suitable method.

These fractures need to be managed properly by decompression of the soft tissues by evacuating the hematoma and achieving anatomical reduction with stable fixation with K- wires preferably through posterior triceps splitting approach and lateral divergent or bilateral crossed pins configuration. This method is the choice for TYPE- III displaced supracondylar fractures of humerus in children.

The results were assessed clinically and radiologically and compared with that of uninjured elbow. The outcome is satisfactory in 80% of patients after a median follow up of 3 to 14 months. Thus, in this study it can be considered that for displaced supracondylar fracture of humerus in children, the treatment of choice is by open reduction and internal fixation with K-wires, to get a good functional and cosmetically better elbow.

KEYWORDS

Open Reduction; Internal Fixation; Anatomical Reduction; Joint Decompression; Supracondylar Fractures; Paediatric Humerus.

INTRODUCTION

Supracondylar fracture of humerus is a common elbow injury among children and constitutes 75% of all fractures around the elbow. The main cause for this fracture is fall on outstretched hand and indirect injury to the elbow. It is the fracture of the lower end of the humerus involving thin portion through the coronoid or olecranon fossae or just above the fossae or through the metaphysis of the lower end of the humerus.

The proper management of injury around the elbow is important because of complications like VIC, Myositis ossificans, stiffness of elbow and malunion resulting in deformities like cubitus valgus or varus and loss of function of elbow.

These complications are especially more common, if initial injuries like displaced supracondylar fractures are not managed properly in time. The traditional treatment with closed reduction and application of plaster slab or cast is inappropriate in the management of displaced supracondylar fractures of humerus as this method is potentially hazardous to circulation, as it may enhance the circulatory insufficiency which is already the hall mark of a supracondylar fracture of humerus and it is difficult to obtain satisfactory reduction and to maintain the reduction. It is essential to minimize the additional trauma to the already traumatized joint and periarticular tissues by repeated attempts of closed reduction.

Hence, surgical management like percutaneous pinning after closed reduction or open reduction and internal fixation with K-wires plays an important role in this type of fractures. But, the open reduction and internal fixation with K-wires allows anatomical reduction of a fracture and decompression of a joint by evacuating haematoma, there by lessening the chances of myositis ossificans and this method allows extension of elbow for comparison of carrying angle and correction of medial or lateral tilt during surgery.

The purpose of this study is to determine the incidence of age and sex distribution of this type of fractures, and management of displaced supracondylar fractures ideally by OR+IF with K-wires, to analyze the results with incidence of complications and causes of failures. The results were graded with cosmetic and functional factors.

OBJECTIVES

The main objectives of the present study are:

1. To study age, sex, and mode of injury leading to displaced supracondylar fractures of humerus.
2. To study the role of open reduction and internal fixation with K-wires in displaced supracondylar fractures of humerus in children.
3. To determine the importance of accuracy of fixation and to know the results.
4. To determine the percentage of stiffness of elbow and to know the causes for the same.
5. To evaluate the importance of surgical fixation in displaced supracondylar fractures of humerus in children.

METHODALOGY

Our present study consisted 10 children who had displaced supracondylar fractures (TYPE III) were treated in department of orthopaedics, Tirtiary care Hospital, Surat, from November 2013 to February 2015.

The patients mainly children coming to Tirtiary care Hospital, Surat in the age group of 3 to 14 years were included in this study.
Exclusion criteria in this study were,

1. Crush injury of elbow.
2. Pathological fractures.
3. Fracture associated with other injuries around elbow.
4. TYPE I, TYPE IIA and TYPE IIB fractures.

MANAGEMENT: the children were examined first in the outpatient department. Information regarding mode of injury and history of any type of treatment was obtained from the parents as well as from the children. Then the general condition of patients was examined and through local examination of affected elbow was carried out to know the presence of edema, blebs on skin and neurovascular status of limb. Then the effected limb was protected by a sting and cuff and required X-rays including anteroposterior view and lateral view were taken, the type of fracture assessed and the patient was admitted as in-patient department.

In our study most of the patients with displaced supracondylar fractures had severe swelling, which might have led to neurovascular insufficiency, hence to avoid further damage to already traumatized joint by repeated manipulation, we posted the patients for emergency open reduction and internal fixation with K-wires.

OPERATIVE TECHNIQUE:

Pre-operatively patients were properly examined and considered fit for surgery. Under general anesthesia and/or block with patient in semi-prone position with the elbow supported on a sand bag and it was left free on the side of the table. Tourniquet was applied. Then the elbow with distal arm painted and draped. We have used Campbell's posterior approach in 50% of patients and modified Campbell's posterior approach in 50% of patients and then triceps with fascia was exposed with isolating and retracting the ulnar nerve. We have used tongue shaped triceps flap method in 50% of cases and triceps splitting

approach in 50% of cases without tracing the ulnar nerve. Then fracture site exposed and collected haematoma was drained and thorough saline wash given. Then fracture was reduced by minimal manipulation and fixed with two crossed K-wires of 2mm to 2.5 mm along the medial and lateral epicondyles in 50% of cases and two lateral divergent K-wires until they had purchase of the opposite cortex in 50% of cases. Then again saline wash was given and rigidity of fixation tested by moving the elbow in all directions and in extension the carrying angle was checked on inspection. Then the wound was closed in layers and the K-wires were cut near the skin and the ends were bent at right angle to prevent migration of the wires. Pressure bandage was applied and the tourniquet was removed, circulation established and confirmed, the finger movements and wrist movements were checked and confirmed. Then the limb was immobilized in A/E plaster slab and patients were shifted to ward.

The limb kept elevated for 2 to 3 days. Antibiotics and analgesic administered for 8 to 10 days. At 9 to 10 days sutures removed and above elbow posterior slab reapplied and kept for 3 weeks. After 3-4 weeks check x-rays were taken and K-wires removed. Then elbow was immobilized in sling and cuff for 2 weeks, and then the active movements without weight lifting were advised.

Serial radiographs were taken at the end of 4 weeks, 8 weeks, 3 months and 6 months. The patients were followed up to 6 months, and changes in the range of movements, carrying angle and Baumann's angle were measured and compared with the normal elbow. Patients were checked for the onset of deformity and restriction of movements. Then the movements were measured by using Goniometer and recorded accordingly. The functional results were graded based on Flynn et.al. Grading,

Table-1

Rating	loss in carrying angle	loss in elbow movements
Excellent	0o – 5o	0o – 5o
Good	6o – 10o	6o– 10o
Fair	11o – 15o	11o – 15o
Poor	>15o	>15o

RESULTS

Data Analysis:

Age Incidence: In our study of 10 cases, the age distribution was between 3-14 years. Majority were between 5 to 10 years, the peak incidence was at 10 years.

Sex Incidence: In our study out of 10 cases, there were 7 boys and 3 girls

Side Involved: The left elbow is more involved than the right side in our study.

Table-2, Type of Fracture Displacement

Displacement	Number Of Patients	%
Postero Medial	7	70
Postero Lateral	3	30

NATURE OF INJURY: The patients in our study gave the history of fall on out stretched hand, fall from height and fall from bicycle

FFRACTURE CLASSIFICATION: TYPE III in Gartland and Wilkins classification of supracondylar fracture of humerus were included in our study.

DURATION OF TIME LAPSE: In our study of 10 cases, 8 patients came for treatment within 24 hrs, 1 patient after 6 days and 1 patient after 10 days.

NERVE INJURY: There was only one child with loss of extension of fingers at MCP joints due to posterior interosseous nerve injury (neuropraxia), it was recovered completely within 4 weeks after surgery.

VASCULAR INJURY: Three children had feeble radial pulse on presentation (but peripheral circulation was adequate) with severe oedema of elbow. They were treated with immediate open reduction with internal fixation and hematoma was evacuated and limb elevated for 2 days after surgery.

LATE COMPLICATIONS: The two patients who came late had flexion block of 13° even after 6 months of follow up.

One patient had lost fixation on 2nd post- op day, it was due to inadequate K-Wire fixation as the K-Wires had no purchase of far cortex. This led to backing of K-Wires during movement of elbow while changing the dressing, so we had to remove the K- Wires immediately and immobilized the elbow in A/E plaster cast for 4 weeks. There was cubitus varus deformity of 6°, limited flexion of 15° on affected elbow.

GRADING OF RESULTS: The results were graded based on Flynn et al criteria clinically & based on Baumann's angle and crescent sign radiologically; and compared with normal elbow.

Table-5 Results

Results	Number Of Cases	%
Excellent	5	50
Good	3	30
Fair	1	10
Poor	1	10

Table-6, Results Along With The Criteria Of Grading:

Results	Loss Of Movements (In Degrees)	Change In Carrying Angle (In Degrees)	Number Of Cases	%
Excellent	0-5	0-5	5	50
Good	6 – 0	6-10	3	30
Fair	10 –15	10-15	1	10
POOR	>15	>15	1	10

DISCUSSION

Supracondylar fracture of humerus is a common fracture seen in children. As its management poses a number of problems like VIC, Nerve palsies, myositis ossificans or cubitus varus or valgus deformity. It has to be managed with minimal manipulation, anatomical reduction and decompression of elbow to obtain excellent results.

To obtain a perfect result, an accurate anatomical reduction is needed; this can be achieved by open reduction and fixation of fracture with K-wires, thus stabilizing the fracture fragments and lessening the risk of vascular and nerve complications. Open reduction of displaced supracondylar fracture of humerus allows decompression of the haematoma and the elbow can be extended for carrying angle comparison at the end of procedure. The posterior triceps splitting approach gives satisfactory results without much problem of stiffness. Cross pinning technique is theoretically more stable biomechanical construct, but it adds to the risk of ulnar nerve injury. Equally stable construct is lateral pinning, in that lateral divergent pinning is more stable than parallel lateral pinning. As these fractures unite in 4 to 6 weeks in children, immediate proper management of these fractures is essential to minimize or to avoid immediate or late complications. As the results are analyzed through clinical and radiological parameters and compared with that of normal elbow, comparison study with other methods of treatment is not necessary. As obtaining a good functional and cosmetically better elbow is important, open reduction and internal fixation of displaced supracondylar fractures of humerus with K-wires may be considered as a satisfactory method of treatment.

The main force stabilizing the fracture results from flexion of the elbow rather than pronation or supination of the forearm. Too much flexion may occlude the circulation, but too little flexion may allow fracture to become displaced, so called “Supracondylar dilemma”, is unique to conservative treatment. Alignment of distal humeral fragment can be achieved without flexion either by static means such as K- wire fixation or dynamically by traction. But the disadvantage of traction is long stay in hospital with close observation and increase in recurvatum of elbow. As the collected hematoma may organize into post-traumatic calcification thus leading to myositis ossificans, it needs to be evacuated from the joint by open reduction and internal fixation, having advantage over the percutaneous closed pinning. But, the main complication of OR+IF are infection and stiffness of elbow can be prevented by strict aseptic precautions during pre-op and post-op period and by meticulous handling of soft tissues.

If open reduction and internal fixation is used when only as a last resort after many unsuccessful attempts at closed reduction, or after a trial of traction for a time ,when the skin and soft tissues are devitalized ,a poor result is to be expected. After reviewing the advantages of open

reduction and internal fixation over other types of management of displaced or TYPE III supracondylar fractures of humerus, it can be considered as the choice of treatment for these fractures.

CONCLUSION

From the present study it can be concluded that, In the management of displaced supracondylar fracture of humerus, closed reduction and application of a cast is inappropriate, as either the initial or the subsequent method of treatment, for this method is potentially hazardous to the circulation and makes it difficult to control the reduction, resulting in loss of the carrying angle and in cubitus varus or valgus deformity. It is increasingly difficult to obtain an excellent result from a displaced supracondylar fracture if the definitive treatment is delayed, due to rapid organization of fracture haematoma leading to myosities ossificans and stiffness of elbow in children.

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