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CLOSED REDUCTION AND PERCUTANEOUS PINNING IN SUPRACONDYLAR FRACTURES OF HUMERUS IN CHILDREN-A PROSPECTIVE STUDY

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Abstract:

Introduction: Supracondylar fracture of the humerus is the most common type of elbow injury in children, accounting for 60% of fractures in this area and represent about 3% of all the fractures in children. Treatment of supracondylar fractures is fraught with many complications including Volkmann's ischemic contracture, nerve injury, arterial injury, myositis ossificans and cubitus varus deformity. Closed reduction and percutaneous was initially described by Swenson and later popularized by Flynn et al.

Materials and Methods: The present study consisted of 30 displaced supracondylar fractures of the humerus in children. All the patients were under 12 years of age treated in the Department of Orthopaedics and Trauma Centre in J.A. Group of Hospitals, Gwalior (M.P.) from 2015 to 2017 for the period of 2 year. Fractures were classified according to Gartlands classification and all the displaced fractures were treated by closed reduction and percutaneous pinning under c-arm.

Results: The minimum age was 4.5 years and maximum age was 12 yrs. Males outnumbered females in all the age groups. According to Flynn's criteria, excellent results were reported in 18 cases (60%), good in 11 cases (36.66%), fair in 1 cases (3.33%) and no poor case. The time of Radiological evidence of union was around 3-5 weeks. The average time of regaining normal range of motion was 9 weeks.

Conclusion: This study shows that close reduction and percutaneous pinning under image intensifier is the treatment of choice in severely displaced supracondylar fractures of the humerus in children.

Key words: *Supracondylar fracture, humerus, elbow injury.*

Introduction

Supracondylar fracture of the humerus is the most common type of elbow injury in children, accounting for 60% of fractures in this area and represent about 3% of all the fractures in children^{1,2}. They also have a high rate of complications if not reduced and stabilized in optimal position which may lead to serious neurovascular injuries and residual deformity.³

Supracondylar humeral fracture usually results by a fall on the outstretched hand⁴. The peak age range in which it occurs is around 5-8 years⁵. The incidence is more in boys and the left or non dominant side is more frequently involved⁵. This fracture may be flexion type or extension type based on the displacement of the distal fragment. Gartland classified the extension type of fracture into 3 types, Type 1 is undisplaced, Type 2 is posteriorly angulated with posterior cortex in contact and Type 3 is completely displaced.⁶

Displaced supracondylar fractures of humerus in children have always challenge to the surgeons. Although several methods of treatment, both conservative and operative are used based on type of fracture pattern. 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. Closed reduction and percutaneous was initially described by Swenson⁷ and later popularized by Flynn *et al*⁸.

The present study has been undertaken to study the results of closed reduction and percutaneous pinning under C-arm.

Materials and Methods

The study has been conducted on patients with displaced supracondylar fractures of the humerus in children upto age of 12 years attending the Department of Orthopaedics and Trauma Centre in J.A. Group of Hospitals, Gwalior (M.P.) from 2015 to 2017 for the period of 2 year. Fractures were classified according to Gartland Classification.

Criteria for selection of patients was as follows

Inclusion Criteria

1. Age upto 12 yrs
2. Closed fractures
3. Displaced fractures
4. Both Extension and Flexion type fractures
5. Fractures within 5 days of injury

Exclusion Criteria

1. Compound fractures
2. Nerve injuries
3. Vascular injuries
4. Fractures with > 5 days from date of injury
5. Comminuted fractures
6. Fractures with intercondylar extension
7. Fractures where closed reduction failed
8. Patients presenting with compartment syndrome

Technique of percutaneous pinning under C-ARM

Under general anaesthesia and fluoroscopic control in supine position, closed reduction was obtained and after obtaining good reduction, the elbow hyperflexed and the forearm pronated to maintain the reduction. Anatomic reduction was confirmed first under the image intensifier before

pinning. The fracture fixed either with two Krishner's wires one from each condyle with an angle of 30-40 degree with the humeral shaft and 10 degree posteriorly or in case of more unstable fractures with two lateral and one medial K-wire. To prevent injury to the ulnar nerve no incision technique was used in which the hyperflexion of the elbow is avoided and in about 80-90 degrees of flexion medial epicondyle is felt and by palpating the medial epicondyle and kirschner wire is inserted. The position of wires confirmed by image intensifier and remaining portion of wires cut and bent to avoid intramedullary migration. Aseptic dressing done and long posterior plaster splint given in 90 degrees of flexion. Post-operative check X-ray taken. The reduction intra-operatively was assessed using Baumann's angle and during follow up the carrying angle was calculated as humero-ulnar diaphyseal angle.

Post operatively

- The limb was elevated for 24 hours.
- Patient was given one stat dose of intravenous antibiotic post operatively.
- Posterior slab was removed after three weeks. Kirschner wires were continued for a period of 1 more week. After that patient was advised to do the active exercises intermittently and further advised to attend the physiotherapy clinic for 1 week and follow up clinics monthly for first 3 months and then at 6 and 9 months.

Follow Up

At each follow up, the following points were recorded:

(A) Clinical

- Range of motion.
- Any change in the carrying angle.
- Neuro - vascular complications.

(B) Radiological

X-ray of both elbow i.e. anteroposterior and lateral views were taken to compare the carrying angle.

Evaluation of results

Table 1: Flynn criteria

Results	Cosmetic factor-loss of carrying angle (degree)	Functional factor - loss motion (degree)
Excellent	0 - 5	0 - 5
Good	6-10	6-10
Fair	11-15	11-15
Poor	>15	>15

Observations

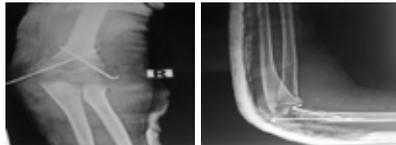
Age Distribution

The minimum age was 2.5 years and maximum age was 12 yrs. Average age was 6.28 years. The maximum incidence was seen in 4 – 9 years of age group. Males outnumbered females in all the age groups.

PRE OP



POST OP



Final Follow UP



Classification Fractures were classified according to Gartland classification.

Table 2

Gartland Type	No. of Cases	% Age
II	09	30%
III	21	70%

Results

The end Results have been classified according to the criteria given by Flynn

Grade	Gartland Type		%
	II	III	
Excellent	4	14	60
Good	3	8	36.66
Fair	-	1	3.33
Poor	-	-	-

In our study, excellent results were reported in 18 cases (60%), good in 11 cases (36.66%), fair in 1 cases (3.33%) and no poor case. The patient had loss of range of motion by 22 degrees. The time of Radiological evidence of union was around 3-5 weeks. The average time of regaining normal range of motion was 9 weeks.

Complications

Iatrogenic complications due to Close Reduction and Percutaneous Pinning under C-arm in our study.

Complications	No. of Cases
Injury to Nerves	
Ulnar	1
Radial	-
Median	-
Myositis Ossificans	-
Migration of Pins	-
Outside Skin	-
Inside Medullary Canal	
Pin Tract Infections	
Superficial	1
Deep	-
Cubitus Varus	-
Cubitus Valgus	-

One case of ulnar nerve injury was due to iatrogenic injury while

putting pins. This cases recovered post – operatively with conservative treatment taking a period of 8 weeks. One superficial pin tract infection occurred and got treated with antibiotics and antiseptic dressing.

Discussion

Supracondylar fracture is a common fracture seen in the pediatric population. The various methods of treatment that have been advocated are closed reduction and above elbow plaster cast application, skin/skeletal traction, primary closed reduction and percutaneous pinning and open reduction and internal fixation by Kirschner wires [2,8,9]. Infection and joint stiffness usually are the problems in open reduction⁹.

Hence closed reduction and percutaneous pinning is the preferred treatment in grade II and grade III displaced supracondylar fractures. 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^{3,10}.

Swenson¹¹ reported excellent results using crossed pin fixation, but others have suggested the pins placed from the lateral condyle in a parallel or crossed configuration to minimize the risk of iatrogenic ulnar nerve injury. Although injury to ulnar nerve from the medial pin is a major concern, especially when fracture is associated with swelling its incidence is estimated to be 2% to 3%. Direct injury to ulnar nerve as well as delayed neuropathy possibly due to stretching of nerve over the medial pin is a known complication. Recent studies comparing the relative strength

of fixation afforded by different configurations of pin placements have crossed medial and lateral pins to be the most stable configurations biomechanically.¹²

Conclusion

From the present study it could be concluded that closed reduction and percutaneous pinning is effective modality for the treatment of displaced supracondylar fractures even in the presence of swelling. The advantages of decreased duration of hospital stay, stable fixation and early mobilization resulting satisfactory functional outcome, less postoperative stiffness, cost effective and cosmesis. It also reduces the incidence of cubitus varus deformity if the surgical technique is followed strictly.

This study shows that close reduction and percutaneous pinning under image intensifier is the treatment of choice in severely displaced supracondylar fractures of the humerus in children.

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