

SURGICAL OUTCOME OF MEDIAL AND LATERAL APPROACH IN TREATMENT OF PAEDIATRIC HUMERAL SUPRACONDYLAR FRACTURE

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ABSTRACT

Background: Approach related significant number of complications can occur in surgical treatment of paediatric supracondylar humeral fracture. **Objective:** To compare the outcome of medial and lateral approach for open reduction internal fixation of paediatric supracondylar humeral fracture. **Patients & Methods:** This comparative cross-sectional study was conducted in department of orthopedic surgery, Bahawal Victoria Hospital, Bahawalpur from 1st March, 2009 to 30th April, 2011. We included 50 patients of displaced, extension type supracondylar fracture of humerus (Gartland type III), which were randomly divided into Group A, in whom medial approach was used for cross K wire, open reduction internal fixation of fracture and group B, which was managed with lateral approach. All patients were discharged on 2nd post operative day. The average duration of follow up was 12 months. The results were assessed according to criteria described by Flynn et al. The data was entered and analyzed by using SPSS version 12. **Results:** Postero-medial displacement of fracture was observed in all patients except 11 (22%). In group A, range of motion was regarded as excellent in 17 (68%), good in 4 (16%) and fair in 2 (8%) patients while 11 (60%) excellent, 5 (20%) good, 3 (12%) patients were fair in group B. 2 (8%) patients in group A and 6 (24%) in group B had poor result. Cubitus varus was not observed in any case of group A, while unsatisfactory results were observed in 3 (12%) cases of group B. Iatrogenic ulnar nerve injury occurred only in one patient of group B, which recovered afterwards while pin track infection observed in 3 cases of each group. **Conclusion:** Approaching supracondylar fracture, through medial approach not only enables the surgeon to have prompt, easy and accurate reduction but also an effective approach in providing better surgical outcome.

Keywords: Supracondylar humeral fracture, Medial approach, Lateral approach.

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INTRODUCTION

During childhood boys and girls may suffer from bone fracture.¹ Fracture of the elbow account for 7-9% and the most common type is supracondylar fractures of humerus. Supracondylar fracture, in more than 70% of the cases is due to fall over outstretched hand and most commonly in non-dominant hand.² These fractures are divided into two types; extension and flexion type. Regarding the amount of displacement, the extension type is divided by Gartland into type I (without displacement), type II (with displacement but intact posterior cortex) and type III (with displacement and disruption of both cortices).^{3,4}

Treatment is controversial and often technically difficult; complications are common. Cubitus varus is the most frequent problem with a mean incidence of 30% in the series reviewed by Smith.⁵ This deformity is due to medial tilting of the distal

fragment, associated with rotation.⁵ It does not remodel with growth, is not progressive and is not due to physeal injury.⁶

A variety of methods of treatment for displaced fractures has been recommended including closed reduction and immobilisation,⁷ traction by various methods⁸ and closed or open reduction stabilised by Kirschner (K-) wires.⁹ Type III is a common reason for surgical treatment among children. Treatment usually consists of closed reduction and internal fixation (CRIF), but in some patients open reduction and internal fixation (ORIF) is required.¹⁰ Surgical indications that are often mentioned include unsuccessful closed methods, severe displacement, pucker sign, severe ecchymosis in anterior part of elbow, vascular insufficiency (weak pulse, ischemic findings in the muscles of forearm) and open fractures.¹⁰ The aim of treatment is to gain a functional and cosmetically acceptable upper limb with a normal range of movement. Ideally, this should be achieved by one definitive procedure. A change in treatment because of loss of reduction may be psychologically traumatic to the child, may give rise to parental anxiety and is associated with an increased risk of a poor outcome.¹¹ A significant number of complications that may occur with surgical treatment of these fractures are approach related. Open reduction can be performed through a

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medial, lateral, posterior or anterior approach or a combination of these. The ideal approach should be safe, quick and associated with appropriate exposure of the fracture site. The objective of this study was to compare the efficacy of medial and lateral approach in surgical treatment of pediatric supracondylar humeral fracture.

PATIENTS AND METHODS

This comparative cross-sectional study was conducted on 50 patients, ranging from 2-11 years of age, presenting in emergency and outdoor department of Bahawal Victoria Hospital, Bahawalpur, from 1st March, 2009 to 30th April, 2011, with supracondylar humerus fracture (Gartland type III). Patients with neuro-vascular compromise or maltreated by bone settler were excluded from the study. These were randomly divided in two groups (A&B). All patients underwent Open Reduction Internal Fixation (ORIF) with cross K-wire through medial approach in group A (25 patients) and through lateral approach in group B (25 patients) within 24 hours of injury. Post operative radiographs of opposite elbow were also taken for measurement of normal Bauman's angle to assess the adequacy of post operative reduction. Patients were discharged on 2nd post operative day. Stitches and back slab was removed after 2 weeks and k-wires were removed after 4 weeks post operatively. Follow up visit were planned on 4 weeks, 3 months, 6 months and 12 months to monitor clinical and radiological recovery.

Post surgical complications like compartment syndrome, nerve injury, vascular injury, pin tract infection, deformity (cubitus varus or valgus), myositis ossificans, and wound conditions were assessed. Baumann's angle difference and bony union were assessed to evaluate the radiological outcome. At the end of 3 months when physiotherapy was completed, range of motion and loss of carrying angle was assessed according to Flynn's criteria (Table .I). The data was entered and analyzed in SPSS version 12.

Table I: Assessment of treatment outcome according to Flynn's criteria

Results	Loss of motion (°)		Loss of carrying angle (°)
Satisfactory	Excellent	0-5	0-5
	Good	5-10	5-10
	Fair	10-15	10-15
Unsatisfactory	Poor	>15	>15

RESULTS

Fifty patients were included in the study. Of the 50 analyzed patients 36 were boys and 14 girls. Most patients 72%, presented with posteromedial displacement. Evaluation of results by Flynn's criteria, in group A, range of motion was regarded as excellent in 17 (68%), good in 4 (16%), and fair in 2 (8%) patients, while 11 (60%) excellent, 5 (20%) good, 3 (12%) patients were fair in group B. 2 (8%) patients in group A and 6 (24%) in group B had poor results as shown in table II. Flynn's criteria regarding carrying angle, after physical treatment ended, showed statistically significant difference between two groups. In group A, 22 (88%) patients were found excellent and 3 (12%) patients have good results. In group B, 18 (72%) were excellent, 3 (12%) were good, 1 (4%) was having fair results. Cubitus varus was not observed in any case of group A, while unsatisfactory results were observed in 3 (12%) cases of group B as depicted in table III. Iatrogenic ulnar nerve injury occurred only in one patient of group B, which recovered afterwards while pin track infection was observed in 3 cases of each group, resolved with antibiotics.

Table II: Flynn's class range of motion

Results	Loss of motion (°)	Group A (n=25)	Group B (n=25)
Satisfactory	Excellent	17 (68%)	11(60%)
	Good	4 (16%)	5(20%)
	Fair	2 (8%)	3(12%)
Unsatisfactory	Poor	2 (8%)	6(24%)

Table III: Flynn's class cosmetic deformity

Results	Loss of carrying angle (°)	Group A (n=25)	Group B (n=25)
Satisfactory	Excellent	22(88%)	18(72%)
	Good	3 (12%)	3(12%)
	Fair	0 (0%)	1(4%)
Unsatisfactory	Poor	0 (0%)	3(12%)

DISCUSSION

Supracondylar humeral fractures are the most common type of elbow fracture in children and adolescents.¹ For treatment of these fractures methods of closed reduction and immobilization, methods of traction and closed or open reduction and fixation with Kirshner wires are recommended. The displaced supracondylar fracture represents a

spectrum of injury from minor swelling of soft tissues to considerable swelling and potential neurovascular complications. A selective approach to treatment is required based on the classification of the fracture and the soft-tissue complications present. Closed reduction and immobilization require 120° of elbow flexion to maintain stable reduction.¹² Flexion to 120° in a swollen elbow may compromise the circulation but less flexion predisposes to loss of reduction. This method has a high incidence of poor results when used for all types of fracture.¹³ To avoid complications, some authors have advocated open reduction and pinning as an alternative treatment.¹⁴ Literature search revealed that in management of type III supracondylar fracture in children, an unfavorable closed attempt is the most common indication for open surgery. Proponents of surgical approach believe that closed anatomical restoration of the severely displaced fractures is difficult to achieve. Many studies demonstrated that ORIF produces the results as good as closed approaches and is associated with very low complications.¹⁴

There are four different approaches that can be used in these fractures; medial, lateral, posterior and anterior. Opponents of ORIF believe that open surgery can cause more adverse events like loss of motion, myositis ossificans and infection.¹⁵ The most common complication of ORIF in surgical treatment of supracondylar fracture in children is loss of elbow joint motion. This complication is usually quoted to be more prevalent in posteriorly treated children.¹⁵

In our study, higher incidence was noted in males (72%) than in females (28%). That difference was reported to relate to the boys' behavior in matter of their players and hazardous activities.¹⁶ In this study the left supracondylar humerus fractures were more common (72%). The higher incidence of the injured left limb was reported in many studies.¹⁷ The extension type in supracondylar humerus fractures in children was reported higher in our study correlating with, what is reported in other literature.¹⁸

According to our study, excellent and good results were 84%, consistent with the study in USA by Reitman¹³ and Water, giving 79% considering loss of motion according to Flynn's criteria. This study is also comparable to European study of Nedim

Samjec et al.¹⁴ Satisfactory results were obtained in 80%, according to Haque MR¹⁵ consistent with 84% in our study.

Iatrogenic ulnar nerve injury occurred in only 1(4%) of cases, as mentioned in study of Anwar et al¹⁶ who suggested 3.5% iatrogenic nerve injury. More than 15 degree loss of carrying angle occurred in 12% of cases as described by Khan and colleagues describing poor results in 10% of cases.¹⁷ Most of the patients in our study were having posteromedial displacement of fragment. So it is the medial side which is displaced, need to be addressed so more fairly through medial approach. This approach not only provides excellent view of supracondylar area, leaves a cosmetically acceptable scar but also enables to avoid iatrogenic injury to ulnar nerve.¹⁹

CONCLUSION

Supracondylar fracture of humerus can be approached through medial side. Medial approach for open reduction and internal fixation of the widely-displaced fracture, is a safe, straightforward, less complicated and ensures anatomical reduction and provides excellent function.

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