OUTCOME OF OPEN REDUCTION AND INTERNAL FIXATION OF DISPLACED MEDIAL EPICONDYLE HUMERUS FRACTURES IN CHILDREN

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ABSTRACT

BACKGROUND: Medial epicondyle fracture is one of the commonest elbow fracture in children. Various treatment options exist inadequate treatment leads to elbow deformity. Our study will highlight one treatment option with open reduction and fixation with k-wires or one screw and one k-wire.

OBJECTIVE: To determine the functional outcome of open reduction and internal fixation of displaced medial epicondyle humerus fractures in children.

MATERIAL AND METHODS: This Descriptive cross sectional study was conducted simultaneously at five orthopaedic units: Orthopaedic Unit District Headquarter Hospital Timergara Lower Dir, Orthopaedic Unit, Saidu Teaching Hospital Swat, Department of Orthopaedics and Trauma Khalifa Gul Nawaz Teaching Hospital Bannu, Orthopaedics and Traumatology Unit "A" Lady Reading Hospital Peshawar and Department of Orthopaedics and Trauma, Pak International Medical College Peshawar from January 2012 to September 2014. Twenty one children meeting the inclusion criteria were operated under general anaesthesia and tourniquet control and fracture was stabilized with either two kirschner wires or a screw and single kirschner wire. All patients were discharged on first or second postoperative day and advised active movements of fingers. Patients were called for follow up visit after two, six and twelve weeks and elbow functions and deformity was evaluated in each visit using modified criteria of Hardacre et al (25).

RESULTS: Twenty one patients including 14 males and 7 females with mean age 12.3 years (range 6 to 15 years) had displaced fracture of medial epicondyle and were operated. Two of our patients were lost in follow up and they were excluded from the final results. After evaluating our results according to modified Hardacre et al criteria, five patients (26.32%) had excellent results, eleven (57.89%) patients had good results and three (15.78%) patients had poor results.

CONCLUSION: Early surgical stabilization of displaced medial epicondyle humerus fractures in children results in excellent and good functional outcome in majority of patients.

KEY WORDS: Medial epicondyle humerus, Open reduction and internal fixation, Kirschner wire.

INTRODUCTION

Elbow fractures are one of the most common traumatic fractures in the pediatric population^{1,2,3} and account for nearly 12 % of all elbow fractures.⁴ The medial Epicondyle is the anatomic origin of the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum superficialis,

palmaris longus, part of the pronator teres, and the ulnar collateral ligament.⁵ Medial Epicondyle fractures have been classified into four types depending on the extent of medial epicondyle displacement: a small degree of avulsion (type I); a non-entrapped avulsed fragment at the level of the joint (type II); a fragment incarcerated in the

joint (type III); and a fracture associated with elbow dislocation (type IV).⁶ The undisplaced or minimally displaced fractures are easily treated with simple immobilization. The surgical treatments are considered when the fracture fragment is displaced into the elbow joint, when ulnar nerve entrapment is suspected, when valgus instability is suspected, or when the fracture fragment is displaced >5 mm.^{7,8,9} Intra-articular incarceration of the epicondylar fragment occurs in 5–18 % of cases.¹⁰ Displaced medial epicondyle fracture requires stable fixation to allow early motion, since elbow stiffness is the most common complication following medial epicondyle fracture when treated conservatively.¹¹ However, the definition of displacement varies between studies; some define the fracture as displaced if >2mm, but others, rely on >5 mm.^{12,13} The best treatment for displaced medial epicondylar fracture remains controversial, as decisions on fixation depend on the anticipated extent of growth remaining in that child and a growing traction-type apophysis, and good to excellent outcomes have been reported for both operative and conservative treatments for displaced medial humeral epicondylar fracture.¹⁴ This study was aimed to know the functional outcome of displaced medial epicondyle fractures of humerus in children who were surgically treated.

MATERIAL AND METHODS

This multi centre study was conducted simultaneously at four orthopaedic units: Orthopaedic Unit District Headquarter Hospital Timergara Lower Dir, Department of Orthopaedics and Trauma Khalifa Gul Nawaz Teaching Hospital Bannu, Orthopaedic and traumatology Unit “A” Lady Reading Hospital Peshawar and Department of Orthopaedics and Trauma, Pak International Medical College Peshawar from January 2012 to September 2014. Twenty patients of both genders having displaced fracture of medial epicondyle humerus, reported within three days of injury and had an age 16 years or less were included in the study. All patients with open fractures, bilateral fractures, other fractures around elbow and pre

existing deformity of elbow or forearm (which would affect the functional outcome) were excluded from the study. All patients were admitted through Accident and Emergency (A & E) or through Out-patient department (OPD). The Ethics Committee of the hospital approved the study and informed consent was obtained from all patients. All fractures were classified into four types depending on the extent of medial epicondyle displacement: a small degree of avulsion (type I); a non- entrapped avulsed fragment at the level of the joint (type II); a fragment incarcerated in the joint (type III); a fracture associated with elbow dislocation (type IV).⁶ Radiographs in anteroposterior and lateral views were used to diagnose and assess the displacement of medial epicondyle. The operative technique was standardized. The operating surgeons were different in this study but of the same caliber (Fellow of College of Physician and Surgeons Pakistan in Orthopaedic surgery) as it was a multicentre study. All surgeries were performed under general anesthesia and within 24-48 hours of admission. After anesthesia patients were put in either supine or lateral position. Tourniquet was applied, Posteromedial incision was made, Ulnar nerve was explored, open reduction was done and fixation achieved with either two K-wires or a screw and single K-wire. Wound was closed and long arm back slab applied. One dose of preoperative antibiotic and three days postoperatively were used in all cases. Postoperative radiographs were taken within 24 hours of surgery. The operated arm was kept elevated for the first 48 hours. The patients were discharged on first or second postoperative day and advised active movements of fingers. Patient was called for follow up after two, six and twelve weeks. Stitches were removed on second week and wires were removed on sixth week. The screw fixation was done in adolescent and was removed after four months, ranging from three to six months. Elbow mobilization was supervised by a physiotherapist. Criteria for results evaluation at follow up visits include deformity, range of movements and complications, according to modified criteria of

Hardacre et al (Table 1 and table 2) with one modification: nonunion or avascular necrosis of the ossification centre was not recorded in our study.

Table 1: Classification of results of treatment of medial epicondylar injuries (modified from Hardacre et al (1971) for lateral epicondylar fracture)

Excellent	Full range of motion No deformity No symptoms
Good	Satisfactory functional range Less than 15 degrees loss of extension Minor, Inconspicuous deformity No arthritic or neurological symptom
Poor	Disabling loss of movement Noticeable deformity or change in carrying angle Any Arthritic or neurological symptom

Table 2: Evaluation of results according to modified Hardacre et al criteria.

	Range of movement (ROM)	Deformity	Symptoms	Results
1	Full ROM	Normal carrying angle	No symptoms	Excellent
2	Mild loss of ROM	Mild deformity	No symptoms	Good
3	Disabling loss of movement	Noticeable deformity Change in carrying angle	Any Arthritic or neurological symptom Neurapraxia of ulnar Nerve	Poor

RESULTS

In our study we included 21 patients; out of these 14 were males and 7 were females. Mean age was 12.3 years, ranging from 6 to 15 years. All these patients had displaced fracture of medial epicondyle. The displacement was more than 5 mm in all cases. Right side was involved in eleven patients while left side was involved in eight patients. Etiological causes for these

injuries were history of fall while playing in 11(52.38%) patients, road traffic accidents in 5(23.81%), fall from heights in 3(14.29%) and physical assault in 2(9.52%) patients. We lost two of our patients in follow up and they were excluded from the final results. Functional outcome of all the patients were evaluated using modified Hardacre et al Criteria. Five patients (26.32%) had excellent results, eleven (57.89%) patients had good results and three (15.78%) patients had poor results. No case of wound infection has been reported in our study.

DISCUSSION

Medial epicondyle fractures are most common in children 7 to 15 years of age. The medial epicondyle is point of the ulnar collateral ligament and the flexor muscles of the forearm. Valgus stress produces traction on the medial epicondyle through the flexor muscles. The child typically holds the elbow in flexion, and any movement is painful. There is point tenderness over the medial epicondyle.^{14,15} In our study the mean age was 12.3 years, ranging from 6 to 15 years. There was male predominance in our study, 14 out of 21 were males while 7 were females. In another study mean age was 13.7 years and there was male predominance in their series as well.¹⁶ In our study fracture etiology was mainly fall in 52.38% of our patients. Similar to our study one other study reported the main mechanism of injury a fall 98% of their patients while results were 80% good with operative treatment.¹⁷ Hines RF et al¹⁸ in their study concluded that operative treatment of medial epicondyle fractures displaced greater than 2 mm gave consistently good results with a good range of motion, good stability, no ulnar nerve symptoms, and no deformity. In our study however, we evaluated results of fractures displaced more than 5 mm. In several studies elbow stiffness has been reported after operative management for medial epicondyle fractures.^{14, 19} However, Louahem, et al²⁰ showed that stiffness was rare even with postoperative immobilization of the elbow (mean of 4 weeks). In another series²¹ only two patients had limited elbow motion,

all other patients had a full range of motion and this study suggested that if there is no intra articular injury or damage to the medial structure of the elbow joint, the epicondylar fragment is united or the immobilization period is less than 4 weeks, a full elbow range of motion recovery can be expected. In our study five patients had full range of movement, three had disabling movements and eleven patients had mild limitations of movement.

Operative fixation of children having displaced fracture of medial epicondyle can be done with two k-wires, one screw plus anti rotation k-wire and two wires plus tension band wire. Those children who are near their skeletal maturity can be fixed with a screw and a wire. In younger children who still have years of growth, fixation with a tension-band wire plus parallel Kirschner wires should be used, as this overcomes the risk of inducing cubitus varus by a screw across the growing apophysis.²² In our study we also fixed the children near to their skeletal maturity with a screw and wires and those who were left with their skeletal growth with two k-wires. Medial elbow stability depends on the medial collateral ligament of the elbow and the forearm flexors.²³ When there is displaced fracture of the medial epicondyle, it compromises the medial stability of the elbow which could be diagnosed under general anesthesia, performing stability tests.¹⁴ Poorly treated displaced medial epicondylar fractures may lead to symptomatic medial elbow instability,²⁴ and proper fixation of displaced medial epicondyle fracture is mandatory to avoid elbow instability later on. As our study sample size was small and with a short follow up period, we recommend further local studies with a larger sample size and a longer follow up period on this topic.

CONCLUSION

Early surgical stabilization of displaced medial epicondyle humerus fractures in children results in excellent and good functional outcome in majority of patients. We therefore recommend open reduction and internal fixation of all such fractures as first line treatment.

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