OPEN REDUCTION AND INTERNAL FIXATION IN IRREDUCIBLE SUPRACONDYLAR FRACTURES OF ELBOW IN PEDIATRIC PATIENTS

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ABSTRACT

Objective: To evaluate results of open reduction and internal fixation (ORIF) in pediatric patients with extension type III supracondylar elbow fractures.

Materials and methods: Thirty eight patients with extension type III supracondylar fracture of the elbow were included in the study. All patients were treated between March 2014 to may 2015 by open reduction and internal fixation (ORIF) with two cross k wires.

Results: Thirty eight patients were included in the study. There were 26 boys (68%) and 12 girls (32%). Mean age of the patients was 6.5 years (03years –10 years). The right side elbow was involved in 11 patients (31%) while left side was involved in 27 patients (69%). All the fractures were internally fixed by two crossed K-wires after open reduction. According to Flynn's criteria, 25 patients (65%) had excellent results, 10 patients (26%) had good results, 02 patients (06%) had fair results and 01 patient (03%) had poor results. Pin-tract or surgical site infections were seen in three patients (7.8%). In two patients infection resolved after removal of pins and antibiotic course while in one patient infection resolved with oral antibiotics. Two patients had cubitus varus deformity at the end of the treatment. Temporary ulnar nerve deficit occurred in 03 (08%) patients who recovered completely in twelve weeks time. Mean range of motion (ROM) of the elbow was 20 – 130 degrees after one and half month postoperatively. Elbow ROM was equal to that of normal side (0 - 140 degrees) after twelve weeks of operation. At last follow-up carrying angle of affected elbow was in range of 8-10 degrees except in two patients who had cubitus varus deformity of the elbow.

Conclusion: Open reduction and internal fixation with two crossed K-wires is an easy and effective operative treatment in supracondylar extension type III fracture of the elbow in pediatric patients, with a low complication rate.

Key words: Open reduction, internal fixation, supracondylar fracture.

INTRODUCTION

In pediatric patients supracondylar fractures of the elbow account for 16.6% of all fractures.[1] These fractures are commonly seen between ages 5 and 8 years.[2,3] Supracondylar fractures of elbow are usually caused by a fall on out stretched hand or less commonly on angle of elbow and is divided into two types, A) Extension type (98%) and B) Flexion type (2%). Extension type supracondylar fractures are further classified into 3 types according to the displacement of the fracture.[4] In type I fracture there is no or minimal displacement of the distal fragment, in type II fracture there is displacement of the distal fragment with intact posterior cortex and in type III fracture there is complete displacement of the fracture with no contact between the proximal and distal fragments. The broad range of nonoperative and operative methods developed with the goal of restoring normal elbow anatomy include long-arm plaster cast immobilization, axial traction applied using a transolecranon pin, elastic and stable intramedullary nailing, external fixation, percutaneous pinning, and pinning after open reduction.[5] Percutaneous pinning is the most widely advocated technique.[6,7] Open surgeries are indicated in patients with irreducible fractures, associated vascular injuries, neglected fractures or open fractures. Percutaneous pinning and open reduction with cross-wiring produce similar functional outcomes and complication rates. Displaced supracondylar fractures of the elbow (extension type III fractures) are unstable fractures and management is usually operative because even if these fractures are reduced closely, chances of later displacement and malunion are high.[8] In our study we included extension type supracondylar fractures of elbow (type III), all of them were managed by open reduction and fixed with two crossed K-wires. Outcome measures were fracture union time, ROM of elbow, carrying angle, signs of infection, presence of deformities secondary to malunion and neurovascular status at the last follow up. The objective of our study was to evaluate early results of Open reduction and cross k wires fixation in extension type supracondylar fractures of elbow (type III).

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MATERIALS AND METHODS

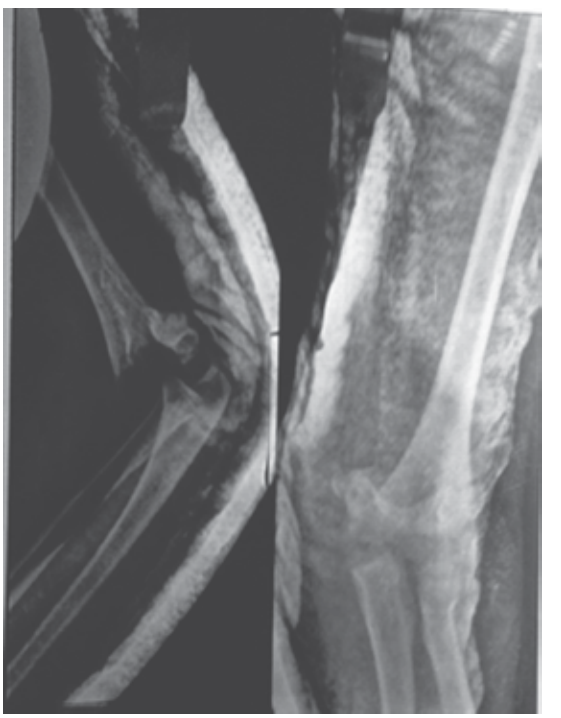
This study was done at department of Orthopedic and Spine surgery unit HMC (Hayatabad Medical Complex) Peshawar from March 2014 to may 2015. Thirty eight patients with Gartland type III supracondylar fractures of elbow were included in this study. Children between ages 3 to 10 years, more than 7 days old fracture, open fractures or patients with neurovascular deficit were included in the study. Exclusion criteria were patients with age less than 3 years or more than 10 years. All admissions were either through Accident and Emergency department (A&E) or outpatient department (OPD). History and complete clinical examination was performed on admission. All patients were placed in elbow back slab for immediate pain relief and stabilization. Patients were monitored closely for signs of compartment syndrome. Patients were prepared for next available surgery list. There were a total 38 patients. There were 26 boys (68%) and 12 girls (32%). The right side elbow was involved in 11 patients (31%) while left side was involved in 27 patients (69%). The mean age of the patient was 6.5 years (range 3 – 10 yrs.) They were followed for a minimum of 6 months. Patients were followed postoperatively at regular intervals. X rays were done at 3rd, 6th and 12th week postoperatively and callus formation or any displacement was noted. Post op physiotherapy was advised after healing. All these type III supracondylar fractures of elbow were managed by open reduction and internal fixation with two crossed K-wires. Posterior midline incision was used and triceps elevated on both sides of distal humerus, Ulnar nerve was exposed in every case. K-wires of appropriate size were used according to the age of the patient. One wire from the lateral side and one from the medial side were introduced and opposite cortex engaged. K- wires were buried under the skin in all the cases. Above elbow back slab was applied to all patients. Postoperatively, operated limb was kept in elevation for at least one day. Backslabs were removed after 2-3 weeks and pins were removed after another 2-3 weeks. X rays were taken after pins removal and patients were referred for physiotherapy. Patients were advised to perform flexion and extension exercises. Flynn's criterion (Table 01) was applied on all patients at last follow up.

Table 1: Flynn criteria

Results	Loss of carrying angle(degrees)	Loss of motion(degrees)
Excellent	0-5	0-5
Good	6-10	6-10
Fair	11-15	11-15
Poor	>15	>15

Table 2: Results according to Flynn criteria

	Number	Percentage
Excellent	25	65%
Good	10	26%
Fair	02	06%
Poor	01	03%



Pre operative x ray

RESULTS

Thirty eight patients were included in the study. There were 26 boys (68%) and 12 girls (32%). Mean age of the patients was 6.5 years (03years –10 years). The right side elbow was involved in 11 patients (31%) while left side was involved in 27 patients (69%). 23(60%) patients presented with neglected (old) fractures, 09(24%) fractures were not reducible (reduction was not satisfactory) and hence were opened and 06 (16%) patients had open fractures. After proper exposure through posterior approach all the fractures were fixed by two crossed K-wires. According to Flynn's criteria, 25 patients (65%) had excellent results, 10 patients (26%) had good results, 02 patients (06%) had fair results and 01 patient (03%) had poor results (Table 02). Compartment syndrome and Volkmann's ischemic contracture was not found in any patient. Pin-tract or surgical wound infections affected 03 patients (7.8%). In two patients infection resolved after removal of pins followed by a course of oral antibiotics while in one patient infection resolved with oral antibiotics treatment. Two patients had cubitus varus deformity at the end of the treatment. Temporary ulnar nerve deficit occurred in 03 (8%) patients who recovered completely in eight to twelve weeks time. Range of motion (ROM) of the elbow was 20 – 130 degrees after one and half month

intra operative picture

Post operative x ray

postoperatively. Elbow ROM was equal to that of normal side (0 - 140 degrees) after twelve weeks of operation. At last follow-up carrying angle of affected elbow was in range of 8-10 degrees except in two patients who had cubitus varus deformity of the elbow.

DISCUSSION

Supracondylar fracture of the elbow is very common injury in pediatric patients. Type III supracondylar fractures are highly unstable fractures and are managed surgically.[9] closed reductions and K-wire fixation is the accepted treatment of type II & type III supracondylar fractures of the elbow when image intensifier is available and patient present early.[10] alternatively patients who present late, in whom closed reduction not achieved or when image intensifier is not available then these patients can be treated through posterior midline incision with open reduction and K wire fixation. In the present study, using Flynn's score[11] 91% of the patients achieved excellent or good outcome and three patients (09%) achieved fair or poor results. A similar series from Kallio et al[12] achieved 90% excellent or good cosmetic results; yet, 10% were rated as poor. Another similar series from Eberhardt *et al*[10] achieved 93% good to excellent functional results. Their cosmetic results were 93% excellent and 7% good, with no poor results. All our patients at six month post op follow up had full range of motion. In the 20 cases of Shannon et al*[13]* all children had a full range of elbow motion compared with their normal side. Three patients in our series had pin tract or surgical site infection which is slightly higher than other series[14,15]. In a series with lateral cross-pinning with proud wires, the pin complication rate was 30%.[18] Two (8%) of our patients had cubitus varus deformity. In a similar series from El-Adl et al*[16]* Cubitus varus deformity was noted in six patients (8.6%). They related it to unsatisfactory reduction of the fracture before pinning. In agreement with other studies[17] all fractures in the present study were immobilized with a long arm splint for 4 weeks before mobilization was permitted. There was no secondary displacement of the fracture after open reduction and cross pinning with this protocol. Stability studies by Zionts et al[18] had demonstrated that crossed pins provided the best stability. More recently, Lee et al[19] using a saw-bone model, found that two 'divergent' lateral pins were comparable to cross-wires in extension, varus and valgus loading, but were inferior in axial rotation testing. Three patients (8%) in our series had signs of ulnar nerve deficit post operatively; this is a well-known complication with a reported incidence of 2 to 8%.[20]

CONCLUSION

Open reduction and internal fixation with two crossed K-wires is an easy and effective operative treatment in supracondylar extension type III fracture of the elbow in pediatric patients, with a low complication rate.

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