ABSTRACT... Displaced Supracondylar fractures of the humerus in children are common injuries treated by orthopaedic surgeons. Objectives: To evaluate the role of open reduction and percutaneous crossed pin fixation in displayed supracondylar fractures and to design a simple and effective protocol for the treatment of these fractures. Design: Prospective. Setting: Independent Medical College Independent University Hospital Faisalabad. Period: From January 2009 to June 2010. Method: Fifty six cases with grade II and grade III Gartland Supracondylar humeral fractures were treated with open reduction through postero medial approach and percutaneous crossed pin fixation with Kirschner wire and followed up for a minimum period of 1 year. Results: Patients were assessed on the basis of Flynn’s criteria there were 41 Excellent and12 good results Conclusions: It is concluded that open reduction and percutaneous crossed pin fixation is a sound and effective treatment for displayed supracondylar fractures with several advantages but requires careful judgment on the part of surgeon to avoid complications.

Key words: Displaced supracondylar fractures open reduction, crossed pin fixation.

INTRODUCTION

Supracondylar fracture of humerus accounts for 60% of all fractures about the elbow in children and represents approximately 3% of all fractures in children.

Many methods have been proposed for the treatment of supracondylar fracture of humerus in children, manipulative reduction immobilization in a plaster cast with elbow flexed, Dunlop’s skin traction, closed reduction and percutaneous pining and open reduction and internal fixation.

Treatment of displaced fracture is fraught with many complications including nerve injury, arterial injury, skin slough, cubitus varus and Volkmann’s Ischemic contracture.

Closed reduction and percutaneous cross Kirschner wire fixation was initially described by Swenson. Iatrogenic ally ulnar nerve injury is possible. Two lateral parallel pins popularized by Flynn to avoid ulnar nerve injury is less stable.

However modified Swenson’s technique of open reduction through postero medial approach and percutaneous crossed pin fixation continues to be used today with excellent results and low morbidity. It is biomechanically most stable as compared to other pin configurations.

The purpose of this study was to evaluate the role of open reduction and percutaneous crossed pin fixation in displayed supracondylar fractures and to design a simple and effective protocol for the treatment of these fractures.

MATERIALS AND METHODS

From January 2009 to June 2010 a total fifty six cases with supracondylar fractures were studied prospectively. All the fractures were unilateral and opposite elbow was taken as control for comparison. The type of fracture was determined according to the Modified Gartland’s classification.

The indication was Gartland grade II and grade III displaced fractures.

Out of total 29 of fractures were grade II and 27 were grade III. Fractures up to 1 month old were included.
Patients with established cubitus varus deformity excluded.

There were 35 male and 21 female the age of patient range form 3 to 13 (mean age 8 years). Left elbow was involved in 36 cases and right side in 20 cases 39 had postereomedial displacement and 17 had posterolateral displacement.

Neurovascular complications, associated fractures and delay before surgical treatment were also recorded.

Associated injuries and complications were both bones fractures forearm in 8 cases, radial nerve injury in 3 cases absent/feeble pulses in 5 cases and impeding compartment syndrome in 2 cases.

**PROCEDURE**

With the patient under general Anaesthesia and in supine position, high up tourniquet applied.

A poster-omedial incision was given longitudinally in hockey stick shape anterior to the medial epicondyle keeping the forearm at 30 flexion. Skin flaps raised – the ulnar nerve exposed above the medial epicondyle and saved. Medial supracondylar ridge identified.

Two spikes near the fracture site in proximal fragment, the distal segment aligned by rotating, manipulating the elbow, keeping medial side in reduced position the medial pin was inserted percutaneously through the

**Table. Gartland’s classification for extension type supracondylar humerus fracture**

<table>
<thead>
<tr>
<th>Fracture type</th>
<th>Description</th>
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<tbody>
<tr>
<td>I</td>
<td>Non-displaced</td>
</tr>
<tr>
<td>II</td>
<td>Minimal to moderately displaced: partially intact posterior cortex</td>
</tr>
<tr>
<td>III</td>
<td>Severely displaced: no cortical contact</td>
</tr>
</tbody>
</table>

A poster-omedial incision was given longitudinally in hockey stick shape anterior to the medial epicondyle keeping the forearm at 30 flexion. Skin flaps raised – the ulnar nerve exposed above the medial epicondyle and saved. Medial supracondylar ridge identified.

Two spikes near the fracture site in proximal fragment, the distal segment aligned by rotating, manipulating the elbow, keeping medial side in reduced position the medial pin was inserted percutaneously through the
center of the medial epicondyle directed upward and laterally at an angle 35 to 40 to the sagittal plan of the humerus and 10 posterior to the coronal plane of the humerus. The pin was thus passed through the distal fragment and medullary cavity of the proximal fragment to engage the cortex of the proximal fragment about 3 cm above the fracture line. The ulnar nerve was saved under vision. Reduction was rechecked, the rotational element corrected, keeping the elbow in flexion and fracture in reduced position, lateral epicondyle palpated and lateral pin was inserted through the lateral epicondyle, the pin was directed upward and medially in a similar manner as medial pin. Pins should cross each other 1.5 to 2 cm above the fracture line. Pins were cut off beyond the skin and ends were bended with plas or wire bender.

The stability of the fracture fixation was checked clinically through movements of the elbow joint and carrying angle of the forearm, tourniquet removed. Haemostasis secured, drain put in and wound closed in layers, keeping the elbow in 90 degree flexion and in full supination. An above elbow plaster applied, window made for wound care dressing bandage applied over the window. In case of massive swelling back slab applied.

The drain was removed after 24 hours. X-rays taken, patients discharged after 72 hours and 1st follow up was done after 7 days. The patients were reviewed at weekly intervals; pop changed after 3 weeks and subcutical stiches removed. Skin condition was assessed. Follow up evaluation was done at weekly intervals for 6 weeks, fortnightly for further 6 weeks and monthly for next 9 months.

Kirschner wires were removed when clinico-radiological union was found satisfactory and active exercises were started. At each review patients were assessed clinically and radio logically with standardized anteroposterior and true lateral x-rays of the elbow at 6 weeks, 3 months, and 6 months and after 1 year.

The results were evaluated on the basis of Flynn’s criteria. There were 94.64% good to excellent and 5.36% fair to poor results. In these patients fair to poor results were due to technical error.

In 1 patient, anatomical reduction was not obtained because of persistent rotation between the fragments.

In 1 patient, the wires were crossing too close to fracture site leading to secondary displacement.

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**Fig. Surgical technique**

(a) under general anesthesia, high up tourniquet (b) ready for incision (c) posteroomedial incision (d) ulnar nerve saved, reduction and medial pin insertion (e) percutaneous lateral pin insertion correcting rotation and carrying angle (f) both pins in crossed configuration (g) bending pins beyond skin (h) wound closure (i) back slab if swelling (j) pop in routine cases
DISCUSSION

Displaced supracondylar fractures of the humerus are one of the commonest childhood injuries and good cosmetic results and functional recovery are the goal of the treatment.

Although good results have been reported using various methods of treatment. In the developing countries many patients presents with history of manipulation and massage and tight bandages. These cases have massive swelling, more chances of compartment syndrome, Volkmann’s ischemic contracture and latter on with massive massage to treat stiff elbow causes myositis ossificans. In such massive swelling stability of closed reduction in hyperflexion may increase circulatory compromise. With closed reduction and cost immobilization the reported incidence of cubitus varus deformity is as high as 24 %.

Studies show poorest correlation with fair to poor results. Time required for functional and cosmetic outcome with this modality of treatment varies from 2 to 6 weeks. The results of skeletal traction mean3 weeks. treatments for these fractures have been varied.

The incidence of cubitus varus deformity with this modality of treatment varies from 0 to 57 %. Other disadvantages of skeletal traction include prolong hospital stay, pin tract infection ulnar nerve injury during insertion of traction pin and elbow stiffness. The compliance for Dunlop’s traction is very poor.

In massive swelling and delayed cases closed reduction and percutaneous pinning is difficult to achieve anatomical reduction and stable fixation. This situation poses a dilemma for the surgeons. In case of close reduction and crossed pin fixation the injury to the professional med j mar 2011;18(1):147-153.

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ulnar nerve from the medial pin is a major concern its incidence is estimated to be 2% to 3% further close reduction is difficult if the time between injury and surgery is more than 7 days.

The pins placed from the lateral epicondyle in a parallel or crossed configurations to minimize the risk of iatrogenic ulnar nerve injury but it is not the stable configuration biomechanically.

The open reduction and percutaneous crossed k-wire fixation has several advantages. Initial fixation of these fractures reduces the duration of hospital stay stable fixation which prevents cubitus varus deformity. If the fracture is treated with open reduction, anatomical reduction, stable fixation with crossed k-wires. It can be splinted in a safe position without any fear of loss of reduction. This decreases mechanical disturbance to the soft tissues and neurovascular structure. This minimizes the risk of complications like compartment syndrome and maximizes circulation.

Our views and results were in concordance with several other studies. Swenson reported excellent results using crossed pin fixation.

However Kirschner wire fixation has its own disadvantages, wire extrusion, pin tract infection and heterotrophic ossification have been reported. These complications cab be prevented by strictly following the surgical technique and proper follow up. The chances of cubitus varus and ulnar nerve injury is minimum in open reduction and doing surgery under vision.

CONCLUSIONS
From the present study it could be concluded that open reduction and crossed pin fixation is a sound and effective modality for the treatment of displaced supracondylar fractures with the advantages of decreased duration of hospital stay, anatomical reduction, stable fixation and early mobilization. It also reduces the incidence of cubitus varus and ulnar nerve damage if the surgical technique is followed strictly. This can be done without causing any additional morbidity.

REFERENCES


SUPRACONDYLAR HUMERUS FRACTURE

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CORRECTION

Correction Prof-1667.wpd

The amendment of the Professional Vol:17, No.04 (Prof-1667) titled: “Mullerian duct anomalies; presentation and reproductive outcome” on page 678 is as under;

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