Percutaneous Pinning in Displaced Supracondyler Humerus Fracture with Two Crossed K-wires in Children

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ABSTRACT

Objective: To evaluate the result of percutaneous pinning in displaced supracondylar fracture of humerus with two crossed k wires in children and to compare the results with the published literature.

Study design: This is a descriptive observational study.

Place and duration: This study was conducted at Orthopaedic B unit Lady Reading Hospital Peshawar, from April 2011 to April 2014 on 100 patients with displaced supracondylar fracture of humerus.

Material & Methods: One hundred patients with closed supracondylar humerus fractures admitted through emergency were included in this study. Patients above the age of 12 years, open fracture, poly trauma and patients with undisplaced type I fractured were excluded while patients with closed supracondylar humerus type II and III fractures below the age of 12 years were included in the study. All fractures were treated with close reduction and percutaneous pinning with two crossed k wires under general anesthesia. Follow up was done for one year with assessment of radiological healing and clinical outcome that is union, joint movement, deformity and neurovascular injuries.

Results: Among 100 patients 60(60%) were male and 40(40%) female. Left involved in 48 (48%) patients and right in 52 (52%) patients. The mean age at the time of presentation was 6.5 years. Among 100 patients 35 were type II and 65 were type III according to Gartland's classification. Union was achieved in all patients within 4 to 6 weeks. The mean period of fracture union was 4.8 weeks.

All patients got union in an acceptable position. 2 patients (2%) developed compartment syndrome. Pin site infection was the common complication and was noted in 15% patients. No deep infection was noted in these cases, and they were treated with oral anti biotics and dressing. All recovered after removal of pins. Neuropraxia of the ulnar nerve was noted in 2%. No iatrogenic vascular injury was noted. Complete range of movement was achieved after 4 to 6 week. None of the patients developed loss of fixation or cubitus varus deformity. Excellent results were in 60% , good results in 39% patients, poor results in only two (2%) patient.

Conclusion: Closed reduction and two cross k wires pinning is a safe and effective method for treating supracondylar fracture of humerus and gives excellent results regarding healing and function.

Key words: supracondylar humerus fracture, crossed k wire fixation, closed reduction.

INTRODUCTION

Supracondylar fracture of the humerus is the most common fracture around the elbow in children (Christopher J.K. Bulstrode, 2004). Two thirds of all hospitalizations for elbow injuries in children are for supracondylar fractures (Wilkins KE, 1991) but the incidence of supracondylar fractures has yet to be documented. Supracondylar fractures accounted for only 3.3% of pediatric fracture (Landin LA, 1983). Supracondylar fractures are most common in children aged less than 10 years, with a peak incidence between ages 5 and 8 years (Henrikson B, 1966). Supracondylar fractures of the humerus in children are the result of trauma to the elbow, most often resulting from a fall from a height or related to sports or leisure activities (Wilkins KE, 1991). These fractures often require surgery and historically are associated with significant morbidity due to malunion, neurovascular complications, and compartment syndrome (Hanlon CR, Estes WL Jr, 1954; Arnold JA et al, 1977) . As a

result, controversy still exists as to what constitutes optimal management of this type of fracture and its complications.

Supracondylar fractures of the humerus are categorized as extension or flexion types. The extension type is the most common, accounting for 90% to 98% of the cases. It is caused by a fall on an outstretched hand with the elbow hyper extended (Minkowitz B, Busch MT, 1994). The characteristic displacement of the distal humeral fragment in extension-type injuries has been reported to be posteromedial in 90% of cases and posterolateral in 10%. The flexion-type fracture, which is caused by fall on a flexed elbow, is a rare occurrence.

There have been numerous attempts in the literature to classify supracondylar fractures. Gartland's classification (Gartland JJ, 1959) is simple and widely used classification. In this system, type I fractures are undisplaced; Type II fractures are displaced with a variable amount of angulations, but the posterior cortex of the humerus is intact. Type III fractures are completely displaced with no cortical contact.

Patients with supracondylar fractures present with pain and swelling around the elbow. Active elbow motion is limited, and gross deformity of the arm may be presents with displaced fractures. Thorough examination of the limb includes evaluation of the soft tissues for severe swelling, skin lacerations, abrasions, neurovascular examination and assessment for other fractures. Patients with supracondylar fractures present with pain and swelling in the upper extremity. With type III Fractures, an S-shaped deformity of the elbow develops due to angulations and translation of the fracture fragments. Fractures of the distal humerus are the most common ipsilateral fractures that occur in conjunction with supracondylar fractures (Kasser J, Beaty J, 2006). Children who sustain supracondylar fractures with diaphyseal forearm fractures are at higher risk of developing compartment syndrome of the forearm than are those with isolated supracondylar fractures (Blakemore LC et al, 2000). Similarly, patient with vascular injury even after successful repair have higher chances of compartment syndrome (Choi PD et al, 2010).

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The two moderan recommendations include nonsurgical immobilization for acute or undisplaced fractures of the humerus or posterior fat pad sign, for type I and closed reduction with pin fixation for displaced type II and III. Closed reduction and percutaneous pinning remains the mainstay of surgical management. Evolving management concepts include that regarding pin placement, the problems of a pulseless hand, compartment syndrome, and posterolateral rotatory instability. They are using a crossed pin configuration to stabilize supracondylar fractures after reduction. This configuration has been shown in clinical series to be effective for maintaining reduction and has been shown in biomechanical testing (Christopher J.K. Bulstrode, 2004) to be superior to other pin configurations, including multiple lateral entry pins. However, ulnar nerve injury occurs in as many as 10% of patients (Skaggs DL et al, 2001).

MATERIALS AND METHODS

This is a descriptive study, conducted at Orthopedic B unit Lady Reading Hospital Peshawar, from April 2011 to March 2014 on100 patients with closed supracondylar humerus fractures. Patients were admitted through emergency. Informed consents were taken from all patients. Patients included were children of both genders with closed displaced supracondylar fractures. Patients above 12 years of age and open fractures were excluded from the study. After receiving the patients in emergency room, proper resuscitation was done according to ATLS protocol and fractured limb was immobilized, analgesia was given and X-rays were done in both AP and LAT view. All fractures were treated with close reduction and percutaneous pinning with image intensifier under general anesthesia. Close reduction was achieved by traction followed by flexing the elbow in pronation and pushing the distal fragment with thumb. After confirming the satisfactory reduction under C Arm, with the elbow held in flexion, one lateral pin was placed percutaneously just proximal to the capitllum in the metaphysis, and one pin was placed percutaneously anterior to the ulnar groove in the medial epicondyle. Less than one cm incision was given before passing the medial epicondylar pin, to avoid injury to the ulnar nerve. Pins were configured to cross proximal to the fracture site in the midline of the distal

humerus. Both cortices were engaged by the wire. The wires were bent to prevent migration and cut close to the skin. Dressing was done and a back slab was applied. Pre and post op antibiotics were given to all patients. Post op x rays were done and the limb was assessed for neurovascular functions. The back slab was removed the elbow was mobilized after three weeks and the wires were removed after four to six weeks. All patients were discharged after twenty four to forty-eight hours after surgery. They were followed up for clinical evaluation (carrying angle, elbow range of motion, neurovascular complications and pin tract infections) and radiological evaluation (fracture displacement, Baumann angle, humero-capitellar angle) at three to four weeks and at six months. The pins and slab were removed after three to four weeks. Active elbow 'range of motion' exercises were encouraged. At the end of six months period, Flynn's criteria (Skaggs DL et al, 2001) were used to grade the result. Results were graded as excellent, good, fair and poor. The patients were then examined after three, six and twelve months. On each visit X-rays AP and Lateral view of the involved limb were advised to see the healing, displacement and angulations.

The data was analyzed using SPSS version 13.0. Descriptive statistic such as frequency, percentage, mean and standard deviation were used.

RESULTS

Among 100 patients 60(60%) were male and 40(40%) female (Table 1). Thirty five patients were type II and 65 were type III according to Gartland's classification (Table 2). Left involved in 48 (48%) patients and right in 52 (52%) patients (Table 3). The mean age at the time of presentation was 6.5 years. Union was achieved in all patients within 3 to 5 weeks.

In the present study all patients got union in acceptable position except two patients where the loss of carrying angle was 10 degree. Two patients (2%) developed compartment syndrome. Pin site infection was the common complication and was noted in 10% patients. In these cases here was no deep infection and they were treated with oral anti-biotics and dressing. All recovered after removal of pins. Neuropraxia of the ulnar nerve was noted in 2% (Table 4). No iatrogenic vascular injury was noted. Complete range of movement was achieved after 4 to 6 weeks except one case where the loss of moments was up to 15 degree. None of the patients developed loss of fixation or cubitus varus deformity. Excellent result was achieved in 60% and good results in 38% patients, with poor results in only two (2%) patient according to Flynn's criteria (Table 5).

Table 1: Distribution of cases according to gender

Gender	Frequency	Percentage
Male	60	60%
Female	40	40%
Total	100	100%

Table 2. Distribution of cases according type of Injury

Type of Injury	No. of Cases	Percentage
Gartland Type II	35	35%
Gartland Type III	65	65%
Total	100	100%

Table 3. Distribution of cases according to the limb Involved

Limb Involved	No. Of Cases	Percentage
Left	48	48%
Right	52	52%
Total	100	100%

Table 4. Distribution of cases according to complications

Complications	Frequency	Percentage
Pin Site Infection	10	10%
Neuropraexia of ulnar nerve	2	2%
Compartment Syndrome	2	2%
Loss Of Carrying Angle (10 degree)	2	2%

Table 5. Outcome Result According to Flynn's Criteria

Outcome	Frequency	Percentage
Excellent	60	60%
Good	38	39%
Poor	2	2%
total	100	100%

DISCUSSION

Supracondylar fractures of humerus in children often require surgery and historically are associated with significant morbidity due to malunion, neurovascular complications, and compartment syndrome (Hanlon CR, Estes WL Jr, 1954; Arnold JA et al, 1977). As a result, controversy still exists as to what constitutes optimal management of this type of fracture and its

complications. The aim of treatment is to achieve a functional and cosmetically acceptable upper limb.

Initially 105 patients were included in the study but five patients (4.76%) were lost in follow up. All these patients were from tribal areas where contacting the patients via phone was not possible. A similar study shows 18% loss of follow up (Shahab ud din et al, 2013). All fractures united within 4 to 6 weeks. The mean period of fracture union was 4.8 weeks. This is comparable to other study by Sing et al (2013).

The authors found 10% pin tract infection which was higher than the reported rate (Shahab ud din et al, 2013; Gupta N et al, 2004; Mehlman CT et al, 2001) . The reason for higher rate of infection may be multiple. The wires were left outside the skin, to make their remover easier, which could increase the infection rate. Moreover, most of the patients belong to poor socio-economic groups with low literacy rate which led to poor wound care. Most of the wires were removed in the OPD without any anesthesia.

Neuropraxia of the ulnar nerve was 2% in the present our study while the reported rate was up to 10% (Shahab ud din et al, 2013; Sing et al, 2013). The present low rate of ulnar nerve injury is because of the technique that was adopted, by giving small incision over the nerve and pushing it to one side (Sing et al, 2013).

Some studies claim that two lateral pin fixation is superior to two crossed pin technique but comparing to the present study shows almost equal results based on clinical outcome (Shahab ud din et al, 2013; Sing et al, 2013).

The strength of this study is its standardized protocol for reduction of fracture, pin placement and follow up evaluation of the patients. The limitations of this study were the number of patients and relatively short follow up. However, this study reinforces the conclusions of other studies regarding the use of two crossed k wires in supracondylar fracture in children.

CONCLUSION

Closed reduction and two crossed k wires pinning is a safe and effective method for treating supracondylar fracture of humerus and gives excellent results regarding healing and function.

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