

Supracondylar Fracture of Humerus in Children Treated with closed Reduction and Percutaneous Cross Pinning vs. Two Lateral Pinning

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ABSTRACT

OBJECTIVE: To analyze and determine anatomical restoration by using percutaneous cross pinning v/s two lateral pinning, functional outcome in these modalities, assess the complications in these methods of treatment and compare patient acceptance of each method.

METHODOLOGY: This was a comparative cross sectional study carried out in the department of Orthopaedic Unit-I, Liaquat University Hospital (LUH) Hyderabad from 01-11-2010 to 31-10-2012. This study consisted of 40 patients admitted through the out patient department as well as casualty department. Detailed clinical examination of the patient was done and recorded in pro-forma. All patients underwent base line and specific investigations especially x-ray.

RESULTS: In this study percutaneous cross pinning group 17(85%) were male and 3(15%) female. In two lateral pinning group 18(90 %) were male and 2(10 %) female. There was wide variation of age ranging from a minimum of 3 years to 13 years in both groups. The mean age was 7.25+3.22 years. The major cause of fracture in this study was fall while playing in 21 patients (52.5%), followed by fall from bicycle in 11 patients (27.5%) and in 8 patients (20%) were due to fall from tree(5 to 7 feet height). In our study, we have 26(65%) patients with postero-medial displacement and 14(35%) patients with postero-lateral displacement. The complications were seen Superficial pin tract infection 0(0%) patients in Percutaneous Cross Pinning VS 1(05%) patients in Two Lateral Pinning group, Non Union 1(05%) patients in Percutaneous Cross pinning VS 2(10%) patients in Two Lateral Pinning group group), K-wire migration 1(05%) patients in Per Cutaneous Cross pinning VS 2 (10%) patients in Two Lateral Pinning group group). Outcome according to flynn criteria were seen in this study, carrying angle loss 2(10%) patients in Per Cutaneous Cross pinning VS 4(20%) patients in Two Lateral Pinning group) and loss of motion 3(15%) patients in Per Cutaneous Cross pinning VS 5(25%) patients in Two Lateral Pinning group.

CONCLUSION: The management with percutaneous cross pinning is better method of treating Supra-condylar fractures of humerus and more predictable as compare to that of two lateral pinning.

KEY WORDS: Supra-condylar fracture, Percutaneous cross pinning, Two lateral pinning, Humerus.

INTRODUCTION

Supra-condylar fracture of humerus is the most common elbow injury in children and approximately 60% of all elbow injuries^{1,2} and represents approximately 3% of all fractures in children^{3,4}. It becomes progressively more uncommon as the child approaches adolescence the average age group of patients being 7½ years⁵. These fractures are seen in the first decade of life and reach a peak at around the age of 8 years⁶. The incidence falls significantly afterwards⁷.

Supra-condylar fracture of humerus occurs due to fall on the outstretched hand with extended elbow⁸. The distal fragment displaced posteriorly in more than 95% of cases extension type and anteriorly in less than 5% flexion type. These fractures are classified, according

to Gartland's⁹ criteria, as non-displaced fractures (type I), partially displaced fractures with the posterior cortex intact (type II) and completely displaced fractures (type III). Completely displaced (type III) fractures were associated with neurovascular injuries, and treatment may be complicated by mal-union, elbow stiffness, iatrogenic neurovascular injury and compartment syndrome.

Treatment is based on the degree of displacement. The preferred method is closed reduction and percutaneous pinning¹⁰. Open reduction is indicated for irreducible fractures, vascular compromise and open injuries¹¹. Various treatment options have been described including: manipulation and casting in flexion, manipulation and casting in extension, traction, closed reduction and percutaneous pinning by Kirschner wires and

open reduction and internal fixation. The inherent instability, difficulty in achieving reduction, and potential for loss of range of movement by keeping the elbow in extension for a long time, makes surgical treatment imperative¹². Emergency treatment has been recommended to avoid vascular compromise and compartment syndrome¹³. The recommended method of percutaneous pin placement differs among authors¹⁴. The purpose of this study is to assess anatomical restoration by using percutaneous pinning, functional outcome and complications in these methods of treatment, compare patient acceptance of each method.

MATERIAL & METHODS

This was a comparative cross sectional study, carried out in Orthopaedics Unit-I, LUH Hyderabad / Jamshoro, from 01-11-2010 to 31-10-2012. An ethical approval was sought from the university ethical review committee, and an informed written consent was obtained from each patient. The inclusion criteria was children between 3-13 years age with close and displaced supracondylar fracture of humerus presenting within 72 hours after fracture, irrespective of gender. All cases were selected from the out patient department as well as casualty department.

Exclusion criteria were compound fracture or fracture with vascular compromise, Open fracture, extension type of supra-condylar humerus fracture with vascular injury, associated with severe chest or abdominal injuries, pathological fractures and mal-united fractures with neurological deficit. Patients were divided in two groups. Group A for percutaneous cross pinning (PCP) and group B for two lateral pinning (TLP). Detailed clinical examination of the patient was done. All the patients were examined to see any major or minor head injury. All patients underwent for base line investigation. Follow up of all these patients was done for six months, initially at two weeks interval for two months then at one monthly interval for next four months. K-Wires were removed after six weeks to assess any complication. All data were entered in a specified proforma designed for this purpose. Data was analyzed through statistical package for social sciences software version (SPSS) 16.0. All the categorical variables like gender, mode of injury are given in frequencies. Continuous variable like age is presented in mean and standard deviation. Chi square test was applied to compare the post-operative complication in TLP & PCP groups and to compare the outcome according to Flynn criteria. The level of significance was set to < 0.05 at 95% Confidence Interval.

RESULTS

The 40 cases of supracondylar fracture of humerus were operated for either percutaneous cross pinning or two lateral pinning. They were divided into two groups; Group A for PCP comprising of 20 patients, Group B for TLP comprising of 20 patients. In PCP group 85% were male and 15% female with male: female ratio of 5.6:1. In TLP group 90% were male and 10% female with male: female ratio of 9:1. The mean age was 7.25+3.22 years.

The major cause of fracture in this study was fall while playing in 52.5% patients, followed by fall from bicycle in 27.5% patients and in 20% patients was due to fall from tree (5 -7 feet height). In this study, we had 65% patients with postero-medial displacement and 35% patients with postero-lateral displacement.

The complications were seen Superficial pin tract infection 5% patients in TLP where as no complication was seen in PCP group, Non Union 10% patients in TLP VS 5% patients in PCP group, K-wire migration 10% patients in TLP vs 5% patients in PCP group (Table I).

The result according to Flynn criteria were excellent (25% patients in TLP VS 40% patients in PCP group), good 30% patients in each group, fair (30% patients in TLP VS 20% patients in PCP group) and poor (15% patients in TLP VS 10% patients in PCP group) (Table II). The outcome according to Flynn criteria were seen in this study, carrying angle loss (20% patients in TLP VS 10% patients in PCP group) and loss of motion (25% patients in TLP VS 15% patients in PCP group) (Table III).

TABLE I: POST OPERATIVE COMPLICATION

Complications	TLP Group		PCP Group		P-Value
	No. of Patients	%	No. of Patients	%	
Superficial pin tract infection	1	5 %	0	0 %	0.594
Non Union	2	10%	1	5 %	
Iatrogenic ulnar nerve injury	0	0 %	0	0 %	
K-wire migration	2	10%	1	5 %	
Cubitusvarus	2	10%	0	0 %	

**TABLE II:
RESULTS ACCORDDING FLYNN CRITERIA**

Results	TLP Group		PCP Group		P-Value
	No. of Patients	%	No. of Patients	%	
Excellent	5	25%	8	40 %	0.731
Good	6	30%	6	30 %	
Fair	6	30%	4	20%	
Poor	3	15%	2	10%	

**TABLE III:
OUTCOME ACCORDDING FLYNN CRITERIA**

Outcome	TLP Group		PCP Group		P-Value
	No. of Patients	%	No. of Patients	%	
Carrying angle loss	4	20%	2	10%	0.001
Loss of motion	5	25%	3	15%	

DISCUSSION

The male to female ratio were seen in PCP group was 5.6:1 as compared to TLP group where it was 9:1. The high rate of fracture in male obviously refers with their life styles, because males are more concerned in outdoor activities in our society. However in the study of Babar I¹⁵ reported 83% were boys and 17% were girls with male to female ratio was approximately 5:1.

The age varies from 3 to 13 years in two groups with mean age of 7.25+3.22 years. The fractures were highly common in the first decade in our study. The other series^{9,10,15} have showed also higher incidence of fractures in younger age groups. However Ostoji Z¹⁶ have showed age range from 1to 14 year with the mean age aged 6.7 years.

Typically these fractures were manifested due to fall on the outstretched hand with extended elbow¹⁷. The fragment of distal portion displaced posteriorly in greater than 95% of cases extension class and anteriorly in less than 5% flexion class. The major cause of fracture in our study was fall while playing in 21 patients 52.5%, followed by fall from bicycle in 11 patients 27.5% and in 20% patients was due to fall from tree. In the study of Fransworth et al¹⁸ reported fall from a height was the major cause of injury in 70% of the cases.

Gartland categorized extension of fractures into three classes primarily based on the degree of displacement¹⁹. In present study, we have 26(65%) patients with

class III A posteromedial displacement and 14(35%) patients with class III B posterolateral displacement , while in the study of Noor Akbar Sial²⁰ reported 29 (51.7%) of fractures were grade II and 27(48.21%)/ were grade III.

Fractures of the humerus Supra-condylar type in children are common injuries and complete displacement of the fragments results in large numbers of the cases. Vascular problem is preventable to a great extent. However, most popular late problem of supra-condylar fracture is Cubitusvarus of the humerus in teenager. They were managed with non-operative treatment without proper reduction and fixation. It was described incidence differed from 4% to 58%²¹. This deformity may result from inadequate reduction, inadequate fixation or from disturbance of growth at the lower end of the humerus. Most authors^{7,22,23} consider the deformity to result from inadequate reduction that leaves a residual rotatory deformity that can collapse into the medial tilt resulting therefore in a varus deformity. In our study Cubitusvarus occurred in (10% patients in TLP VS no patient in PCP group).

The current literature on Supra-condylar humeral fracture suggests that percutaneous pinning should be used for most of the extension-type fractures, even for the minimally displaced ones^{24,25}. According to some authors^{5,9,26}, closed reduction and immobilization is affiliated with a considerable ratio of early and late snag, inclusive of Volkmann ischemic contracture and cubitus varus²⁶. In this study superficial pin tract infection (5% patients in TLP VS no patients in PCP group), Non Union (10% patients in TLP VS 5% patients in PCP group), K-wire migration (10% patients in TLP VS 5% patients in PCP group). However in the study of Antoine de Gheldere²⁷ reported median nerve injury 5.8% in Gartland type II and 2.5% in Gartland type III where as ulnar nerve injury 2.5% in Gartland type II.

The present study revealed the carrying angle loss (20% patients in TLP VS 10% patients in PCP group) and loss of motion (25% patients in TLP VS 15% patients in PCP group). In the study of NedimSmajic²⁸, Loss of motion in the injured elbow compared to the healthy one after the physical treatment was completed 8.83±11.03° in the first group, while in the second group it was 14.43±12.68°.

The objective of treatment is to serve an acceptable functional and cosmetic upper extremity with a normal range of motion²⁹. Flynn's criteria are often applied in the assessment of supra-condylar fracture healing. They estimate the carrying angle as a cosmetic factor, and loss of motion as a functional factor. These criteria specifically evaluate the cosmetic and functional factors, as the patient may have a deformity but good function or bad function with no deformity. The end

result for patients who have changes in the carrying angle and range of motion is based on the greater clinical loss. This means that if a patient has good functional and fair cosmetic outcome will be evaluated as fair. According to Flynn's criteria, the final outcome of treatment in the present study achieved excellent were in (25% patients in TLP VS 40% patients in PCP group), good 30% patients in each group, fair (30% patients in TLP VS 20% patients in PCP group) and poor (15% patients in TLP VS 10% patients in PCP group), which is comparable with the results of Abdul Q Khan³⁰, who reported forty patients had excellent results 88.88%, 2 cases had good results 4.44%, one patients had fair results 2.24% and 2 patients had poor results 4.44%.

CONCLUSIONS

The management with percutaneous cross pinning is better method of treating Supra-condylar fractures of humerus and more predictable as compare to that of two lateral pinning.

- Supra-condylar humerus fracture is most common among young males.
- The management with PCP is better method of treating Supracondylar fractures of humerus. It has the following advantages;
- The results of this method of treatment are more predictable as compare to that of TLP.
- The rate of complication is lower than that of plaster cast.
- The technique can be learnt easily.

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