PERCUTANEOUS PINNING IN DISPLACED SUPRACONDYLAR FRACTURE OF HUMERUS IN CHILDREN

Waseem Anwar, Malik Javed Iqbal, Noor Rahman
Department of Orthopaedics, PGMI Hayatabad Medical Complex, Peshawar - Pakistan

ABSTRACT

Objectives: To know the effectiveness and safety of percutaneous pinning in displaced supracondylar fracture of the humerus in children.

Material and Methods: This case series study was conducted from January 2007 to July 2009 in the Orthopaedic Unit of Hayatabad Medical Complex, Peshawar.

Results: Of the 50 patients, there were 33(66%) males and 17(34%) females. The left side 38(76%) was the most dominant site of the fracture as compared to the right side which were 12(24%). Mean age of patients was 7.02 ± 2.25 years. The age ranged from 1 to 12 years. At the final follow-up, using Flynn’s criteria, 36 (72%) out of 50 patients with carrying angle loss had excellent results and 14(28%) had good results. Using Flynn’s criteria for loss of range of motion, 12 patients (24%) had excellent result, 26(52%) good results, 10(20%) fair results and 2(4%) poor results.

Conclusion: Percutaneous pinning is safe, cost effective and provides greater skeletal stability with excellent results.

Key words: Supracondylar fractures, percutaneous pinning, ulnar nerve.

INTRODUCTION

Supracondylar fracture of the distal humerus is the second commonest fracture in children.\(^1\) It generally occurs as a result of a fall onto the outstretched hand with the elbow in full extension while flexion type is generally believed to be a fall directly onto the elbow.\(^2\) There are two types of supracondylar fractures of humerus in children according to the direction of distal fragment: Extension type (97% to 99%) and Flexion type (1 to 3%).\(^3\) According to the Gartland system, supracondylar humeral fractures are classified as extension type I, II and III.\(^4\)

Treatment of supracondylar fractures of humerus in children is based on the direction of displacement and ability to obtain an acceptable reduction. Numerous techniques have been described, including closed reduction and application of cast, traction (both skin and skeletal), closed reduction and percutaneous pinning, and open reduction and internal fixation.\(^5\) Closed reduction and casting for displaced supracondylar fractures in children may lead to loss of reduction and cubitus varus deformity while in case of percutaneous pinning these complications are very low.\(^6\) Open reduction and internal fixation can reduce the fracture anatomically but the chances of loss of elbow motion are high.\(^7\) Percutaneous pinning is safe, cost effective, time saving and provides greater skeletal stability with excellent results.\(^8\) Therefore, this study has been conducted to focus the attention of orthopedic surgeons towards the minimal invasive technique of percutaneous pinning in the treatment of displaced supracondylar fracture of the humerus in children and its lower complication rate.

MATERIAL AND METHODS

This prospective case series study was conducted from January 2007 to July 2009 with a follow up of six months in Orthopaedic Department of Postgraduate Medical Institute, Hayatabad Medical Complex, Peshawar. The inclusion criteria were children of 1-12 years of age with displaced supracondylar fractures of humerus (Gartland II & III), and patients presenting within 72 hours. The exclusion criteria were open fractures and fractures with neurovascular complications.

All patients who presented to the Orthopaedic unit of this institute with displaced supracondylar fractures of the humerus and fulfilling our inclusion criteria were admitted and recruited in our study. Back slab was applied and neurovascular status was checked. After obtaining informed consent for the study and surgery, baseline investigations were performed. Surgery was arranged on the same day or the following morning, under general anaesthesia.

During surgery the patient was placed supine with the injured upper arm at the side of the table. Image intensifier was placed along the table at the...
RESULTS OF THE TOTAL 50 PATIENTS PRESENTING DURING THE STUDY PERIOD THERE WERE 33(66%) MALES AND 17(34%) FEMALES. LEFT SIDE 38(76%) WAS AFFECTED MORE COMPARED TO THE RIGHT SIDE WHICH WERE 12 (24%). THE AGE RANGED FROM 1 TO 12 YEARS. THE MEAN AGE WAS 7.02 ± 2.25 YEARS. AT THE FINAL FOLLOW-UP, USING FLYNN’S CRITERIA 6 FOR GRADING INVOLVES THE EVALUATION OF CARRYING ANGLE LOSS AND TOTAL RANGE OF MOTION LOSS (TABLE 1). LOSS OF CARRYING ANGLE, LOSS OF RANGE OF MOTION, BAUMANN’S ANGLE AND METAPHYSEAL-DIAPHYSEAL ANGLE, ULNAR NERVE INJURY AND COMPARTMENT SYNDROME WERE ASSESSED FOR BOTH INJURED AND UNINJURED ARM AT EACH VISIT. ALL DATA WAS COMPILED AND ANALYSED WITH SPSS VERSION 10. THE DESCRIPTIVE MEASURES, LIKE MEAN ± STANDARD DEVIATION WERE CALCULATED FOR AGE, BAUMANN’S ANGLE, AND METAPHYSEAL-DIAPHYSEAL ANGLE. FREQUENCY AND PERCENTAGE WERE CALCULATED FOR OTHER QUALITATIVE VARIABLES LIKE LOSS OF CARRYING ANGLE, LOSS OF RANGE OF MOTION AND ULNAR NERVE.

Table 1: Flynn criteria for reduction assessment

<table>
<thead>
<tr>
<th></th>
<th>Loss of carrying angle (degree)</th>
<th>Loss of range of motion (degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0–5</td>
<td>0–5</td>
</tr>
<tr>
<td>Good</td>
<td>6–10</td>
<td>6–10</td>
</tr>
<tr>
<td>Fair</td>
<td>11–15</td>
<td>11–15</td>
</tr>
<tr>
<td>Poor</td>
<td>&gt;15</td>
<td>&gt;15</td>
</tr>
</tbody>
</table>

DISCUSSION

Supracondylar humeral fractures are common. The peak incidence is between the ages of five and ten years. 9 The type III supracondylar humeral fracture is challenging. As reflected in the literature, there is still some controversy with regard to the ideal treatment method. In most cases the standard technique includes closed reduction with manipulation followed by stabilization with either cross-pins or multiple lateral pins. 10 Closed reduction followed by immobilization, either by casting or Blount’s technique, is indicated in type-II fractures but is usually considered to be unreliable for type III displaced fractures. 9 The incidence of secondary displacement during healing period makes repeat follow-up radiographs essential particularly when using Blount’s technique. Analysis of the initial stability after reduction requires considerable experience. Skin or skeletal traction requires a longer period in hospital and does not provide any advantage over immediate reduction. 2,11

Percutaneous pinning after closed reduction of supracondylar fractures has got several advantages. Immediate fixation of these fractures reduces the duration of hospital stay. The technique provides anatomic and stable fixation which prevents cubitus varus deformity. In developing countries, many patients present with a history of manipulation and massage. These cases have a high incidence of compartment syndrome and myositis ossificans. This situation poses a dilemma for the surgeon in whether to increase stability of closed reduction by hyperflexion which may increase circulatory compromise or whether to apply Dunlop’s traction till the swelling subsides. If the fracture is fixed immediately after closed reduction it can be splinted in a safe position without any fear of loss of reduction. This minimizes the risk of compartment syndrome and maximizes circulation.

To evaluate our results, we chose Flynn’s grading. This is the most rigorous classification since any cubitus varus deformity is considered to be a poor result, whatever the function of the elbow. Comparing the results of our treatment protocol with other published series, we consider it to be a safe method. It provides greater skeletal stability with excellent results even when undertaken by less experienced surgeons. However, Kirschner wire fixation has its own disadvantages. Complications such as ulnar nerve injury, wire extrusion, pin tract infection and heterotopic ossification 4,11, have been reported.
Cubitus varus deformity, after this modality of treatment can be prevented by strictly following the surgical technique. It is usually due to reduction or fixation of fragments in poor position and improper placement of Kirschner wires.\textsuperscript{11,12}

The commonly known complication in the treatment of closed reduction and percutaneous pinning of displaced supracondylar fractures of humerus is iatrogenic ulnar nerve injury with the use of a medial pin.\textsuperscript{15} The rate of ulnar nerve injury varies in different studies. Slobogean et al\textsuperscript{16} calculated that one iatrogenic ulnar nerve injury occurred in every 28 cases treated by cross pinning. The largest series of 473 children, treated with closed reduction and percutaneous pinning, revealed 25(5.2%) ulnar nerve injuries\textsuperscript{17}. Lyone at al\textsuperscript{18} have reported this number as 6%, Shoab et al\textsuperscript{19} as 5% and Ozturkmen et al\textsuperscript{19} reported no iatrogenic ulnar nerve injury. In our study the frequency of iatrogenic ulnar injury was 2%. The limitation of our study was short follow-up; all patients were followed for a six month period, because in our set up, it is not feasible for most of the patients to carry on with further follow up. Although cubitus varus may take one year to develop but we can have some idea about the development of cubitus varus within six months\textsuperscript{20}.

CONCLUSION

Closed reduction and percutaneous pinning is a sound and effective modality for the treatment of displaced supracondylar fractures. Along with the advantage of decrease duration of hospital stay, stable fixation and early mobilization, it also reduces the incidence of cubitus varus deformity if the surgical technique is followed strictly.

REFERENCES