CLOSED REDUCTION AND PERCUTANEOUS PINNING IN DISPLACED SUPRACONDYLAR HUMERUS FRACTURES IN CHILDREN

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ABSTRACT

BACKGROUND
Displaced supracondylar fractures of the humerus in children are common paediatric injuries treated by orthopaedic surgeons. Literature is very clear that these fractures should be reduced and fixed in optimal position to avoid complications like neurovascular injuries and residual deformity. Of the various methods available for the treatment of these fractures, closed reduction and percutaneous pinning has shown improved results.

MATERIALS AND METHODS
The study was conducted in the Department of Orthopaedics, Tripura Medical College, Hapania, Agartala, during the period of September 2010 to December 2012, 42 cases of supracondylar humeral fractures (Gartland Grade-II and Grade-III) with less than 1-week old were included in this study. They were treated with closed reduction and percutaneous pinning with Kirschner wires under image intensifier guidance. Clinical outcome was assessed according to Flynn’s criteria.1,2,3

RESULTS
The mean age at the time of operation was 6 years (Range 2-10 years) and the average follow-up was 16.3 months (Range 8-26 months). As per Flynn’s criteria results were graded, excellent – 37 (88.09%), good – 03 (7.14%), fair – 1 (2.38%), poor – 1 (2.38%).

CONCLUSION
Closed reduction and percutaneous pinning is a good and effective treatment for displaced supracondylar fractures in children.

KEYWORDS
Displaced Supracondylar Fractures, Closed Reduction, Percutaneous Pinning


INTRODUCTION
Supracondylar fracture is one of the commonest fractures in children, account for 60% of all fractures around the elbow joint and represent approximately 3% of all fractures in children.3
Displaced supracondylar fractures of humerus have always presented a challenge to the orthopaedic fraternity. Many methods have been proposed ranging from closed reduction and plaster cast immobilization to percutaneous pinning and even open reduction and internal fixation with Kirschner wire fixation.4,5,6,7,8,9

Literature is very clear that displaced supracondylar fracture in children (Gartland type II and III) should be fixed. Closed reduction and percutaneous pinning was initially described by Swenson and later popularized by Flynn et al.4,10

It is a simple procedure with excellent result and biomechanically most stable as compared to other operations. The purpose of the study was to evaluate the role of closed reduction and percutaneous pinning in displaced supracondylar fracture of humerus in children.

MATERIALS AND METHODS
In a prospective study closed reduction and percutaneous pinning for 42 displaced supracondylar fractures of the humerus were performed at Tripura Medical College and Dr. BRAM Teaching Hospital, Hapania, Agartala.

The indication for pin fixation was Gartland Grade-II and III fractures. Out of the total 42 fractures, 30 were Grade-II and 12 were Grade-III. The maximum fractures were due to fall on outstretched hand. Fractures older than 1 week were not included. There were 26 males and 16 females. The age of the patients ranged from 2-10 years (mean age 6 years). Left elbow were involved in 22 cases and right elbow were involved in 20 cases; 27 cases had posteromedial displacement and 15 cases had posterolateral displacement.

Traction was given under general anaesthesia with the elbow in 20-30 degrees, forearm supination with an assistant applying counter traction and after disimpaction of fracture medial and lateral displacement was corrected by applying a varus or valgus force. The angulation was corrected by flexing the elbow with continued traction and pressure by thumb. The radial pulse was observed at regular interval during entire procedure. Reduction was checked by fluoroscopy; once it was acceptable the assistant held the elbow in the same position and one smooth Kirschner wire (1.5 to 2.0 mm) was passed from the lateral epicondyle, in most of the cases 2nd Kirschner wire was used from the centre of the medial epicondyle. The pins should cross each other 1.5 cm– 2 cm above the fracture line. In a few cases, we used one additional Kirschner wire from the lateral side additional.

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Medial and lateral crossed wire used in most cases, as this has proven to be the most stable construct.

Sometimes, we have introduced one additional Kirschner wire from medial or lateral side. The whole procedure was done under C-arm image intensifier control. The pins were cut off subcutaneously. An above elbow plaster slab was applied in supination in 80-100 degrees of elbow flexion. Patients were discharged after 48-72 hours. The patients were received at weekly intervals. Kirschner wires were removed when radiological unions were found satisfactory and active exercise started. Followup evaluation was done at weekly intervals for 6 weeks, monthly for 6 months and 3 monthly intervals thereafter. At each review, patients were evaluated clinically and radiologically on the basis of Flynn’s criteria.

<table>
<thead>
<tr>
<th>Results/ Ratings</th>
<th>Cosmetic Factor, Carrying Angle Loss (Degrees)</th>
<th>Functional-Factors, Movement Loss (Degrees)</th>
<th>Overall Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0-5</td>
<td>0-5</td>
<td>The lower of the two ratings and an elbow with a varus deformity is automatically graded as poor</td>
</tr>
<tr>
<td>Good</td>
<td>5-10</td>
<td>5-10</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>10-15</td>
<td>10-15</td>
<td></td>
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<tr>
<td>Poor</td>
<td>&gt;15</td>
<td>&gt;15</td>
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**Table 1: (Flynn’s Criteria)**

**DISCUSSION**

Various methods of treatment have been advocated in the form of closed reduction and above elbow plaster cast application, skin/skeletal traction, primary closed reduction and percutaneous pinning and open reduction and internal fixation by Kirschner wires. Closed reduction and percutaneous pinning is the preferred treatment in Grade-II and Grade-III displaced supracondylar fracture in children (Table-II).

Swenson reported excellent result using crossed pin fixation, but others have suggested the pin placed from the lateral condyle in a parallel or crossed configuration to minimize the risk of iatrogenic ulnar nerve injury. Although injury to ulnar nerve from the medial pin is a major concern, especially when fracture is associated with swelling, its incidence is 2% to 3%. The frequency of this complication in reported series ranges from 0 degree to 5 degrees.

In our series, it was none. Compartmental syndrome another complication of percutaneous pinning in supracondylar fracture humerus in children, Lee et al. have similar observation, was not found in our series.

Although modern pinning techniques have reduced the incidence of cubitus varus deformity. This continues to be the most common complication following pinning of supracondylar fracture of the humerus. The cause of deformity is coronal rotation or tilting or a combination of both, of distal fragment. The most important factor correlating with the final varus deformity following close reduction and percutaneous pinning is the difference in Baumann’s angle between the operated and normal side. In all patients Baumann’s angle was restored within 4 degrees of the uninjured site. In addition, other criteria like the restriction of the clear space between olecranon and capitellum and transaction of the capitellum by anterior humeral line on the lateral radiograph were also employed.

Also the carrying angle was assessed by fully extending the elbow after the crossed pinning was complete. None had cubitus varus deformity at a minimum followup of 8 months. Our study results agree with other studies, which have reported that cubitus varus is caused by inadequate reduction. Another major concern with delayed treatment is the inability to achieve satisfactory closed reduction because
of swelling, thus produce higher chance of conversion to open reduction has been reported in literature, ranging from 3 degrees to 46 degrees. In our series closed reduction and percutaneous pinning was successful in all cases with good-to-excellent result 96.2%.

Recent studies comparing the relative strength of fixation afforded by different configurations of pin placements have crossed medial and lateral pins to be the most stable configuration biomechanically. Many studies published on the results of percutaneous pinning differ in their clinical grades of patients. Though most studies have a very few poor results, usually less than 5-10%, there is not a clear match in terms of good and excellent results. In general, the studies with long-term followup results show a higher percentage of excellent results like the studies from Flynn et al. Pirone et al. The reason for a few of the patients in our study, not falling into the excellent results category were a little terminal limitation of flexion and extension. This was more commonly seen in the patients who had short followup around 8 months. Possibly in long followup, the range of movement of elbow would be improved.

<table>
<thead>
<tr>
<th>Table 2: Clinical Findings Compared with Other Series in the Literature</th>
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<tbody>
<tr>
<td>Treatment</td>
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<tr>
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<tr>
<td>1. Closed reduction and cast</td>
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<tr>
<td>2. olecranon traction</td>
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<tr>
<td>3. Closed reduction and lateral K-wiring</td>
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<tr>
<td>4. Percutaneous cross pinning</td>
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<td>5. Open reduction and K-wiring</td>
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<td>6. Present study Percutaneous pinning</td>
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CONCLUSION
From the present study, it could be concluded that closed reduction and percutaneous pinning is a sound and effective modality for the treatment of displaced supracondylar fracture in children even in presence of swelling.

REFERENCES