Original Article

Type-III supracondylar fracture humerus: results of open reduction and internal fixation after failed closed reduction

Naji ullah Khan, Zahid Askar, Faheem ullah

Department of orthopaedic, Khyber Teaching Hospital, Peshawar.

ABSTARCT

Objective
To evaluate short term results of open reduction and internal fixation after failed close reduction in Gartland Type III Supracondylar fracture of humerus in our institution.

Patients and Methods
This prospective study was conducted at the Orthopedic Department of Khyber Teaching Hospital, Peshawar from January, 2008 to March, 2009. Seventy-five patients of type-III supracondylar fracture of humerus were included in the study. Informed consent was obtained from all patients. Under general anesthesia, closed reduction was attempted first. After failure of closed reduction, an open reduction and internal fixation with cross K-wires was performed. Fortnightly follow up was carried out for two months then monthly for six months. The clinical outcome was assessed using Flynn criteria

Results
Out of 75 patients, 47 were male and 28 were female. Left side was involved in 52 patients and right side in 23. Mean age was 6.7 years with age range from 3 to 12 years. Excellent or good results were obtained in 70 (93.3%) patients and fair or poor in 5 (6.7%).

Conclusions
We conclude that these fractures need to be managed aggressively and open reduction and internal fixation of severely displaced supracondylar fractures of the humerus is a safe option when a satisfactory reduction cannot be obtained by 2-3 attempts on closed method. (Rawal Med J 2010;35: ).

Key words
Supracondylar fracture, open reduction, internal fixation, close reduction

INTRODUCTION
Supracondylar fracture (SF) of the humerus is the most common fracture around the elbow in children and represents approximately 3% of all fractures in children.1,2
These fractures are seen in the first decade of life especially between ages 5 and 8 years.\textsuperscript{3,4} SF of humerus are caused by fall on outstretched hand and is divided into two types, extension type and flexion type.\textsuperscript{3} 97.7\% of the fractures are extension type and 2.2\% are flexion type.\textsuperscript{3} Extension type are further classified as describe by Gartland according to the degree of displacement of the distal fragment.\textsuperscript{2,6} Type I is undisplaced fracture, type II is displaced with intact posterior cortex, and type III is completely displaced with no contact between the fragments (Fig 1).\textsuperscript{7}

The treatment modalities include side arm traction, overhead skeletal fraction, closed reduction and casting with or without percutaneous pinning and open reduction and internal fixation.\textsuperscript{8,9} Type III SF of humeral are usually treated by closed reduction and percutaneous K-Wires fixation, but open reduction and fixation is performed if an adequate reduction cannot be obtained by closed manipulation.\textsuperscript{10-13} Close manipulations should be avoided in displaced type-III postrolateral SF with neurovascular deficit as the neurovascular bundle may be trapped in the fracture site.\textsuperscript{4,14} The indications for open reduction and internal fixation (ORIF) are failed closed reduction, open fractures that needs debridement and irrigation, and fractures complicated by vascular injuries.\textsuperscript{4} Open reduction must be carried out carefully to prevent complications like varus or valgus deformities, myositis ossifican, stiffness of the elbow, neurovascular complications and compartment syndrome.\textsuperscript{15,16} The purpose of this study was to evaluate the short term results of open reduction and internal fixation after failed close reduction in Gartland Type III SF in our circumstances.

**PATIENTS AND METHODS**

This prospective study was conducted at the Orthopedic Department of Khyber Teaching Hospital Peshawar from January, 2008 to March, 2009. 75 patients with closed Gartland type III SF of humerus were included in the study. Patients included were children 3 to 12 years of age. Those with vascular injury were excluded from the study.
Fig 1. Gartland classification of supracondylar fracture.

Type I. Undisplaced fracture.

Type II. Fracture is displaced with intact posterior cortex.

Type III. Fracture is completely displaced with no contact between the fragments.

All patients were admitted through Accident and Emergency department. Detail history and clinical examination was performed on admission after obtaining written and informed consent. The patients were either put on side arm traction or placed in posterior splint for temporary stabilization. Distal neurovascular status was monitored closely. Patients were prepared for next day surgery.
Surgical Technique

Under general anesthesia, closed reduction was attempted first; in the event of its failure, a pneumatic tourniquet was applied and posterior midline incision was given. Ulnar nerve was identified, dissected and isolated. After elevating triceps muscle, the fracture side was cleaned, reduced and fixed with 2 cross K-wires of appropriate diameter. In most patients, Brachialis was found to be interposed between the two fragments and was responsible for the failed closed reduction. The ends of the wires were left outside the skin for easy removal later on. Skin was closed and posterior slab was applied.

Table 1. Flynn criteria for fracture assessment.

<table>
<thead>
<tr>
<th>RESULTS</th>
<th>Cosmetic Factor-Loss of Carrying Angle (Degree)</th>
<th>Functional Factors-Loss 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>

The patients were follow up fortnightly for 2 months and then monthly for 6 months. At two weeks, sutures were removed and posterior slab was reapplied. At six weeks, K-wires and slab were removed without anesthesia after taking a radiograph of the elbow. Range of motion exercises were started and final assessment was made at 6 month using Flynn criteria\(^ {17}\) (table 1).

RESULTS

All 75 patients completed their follow up; there were 47 (62.7%) male and 28 (37.3%) female. Left side was involved in 52 (69.3%) patients and right side in 23(30.7%) patients. Mean age was 6.7 years (age from 3 to 12).

Table 2. Outcome of procedure according to Flynn criteria.

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>58</td>
<td>77.3%</td>
</tr>
<tr>
<td>Good</td>
<td>12</td>
<td>16.0%</td>
</tr>
<tr>
<td>Fair</td>
<td>3</td>
<td>4.0%</td>
</tr>
<tr>
<td>Poor</td>
<td>2</td>
<td>2.7%</td>
</tr>
</tbody>
</table>
Excellent or good results were obtained in 70 (93.3%) patients (Table 1). Poor result was because of myositis ossificans in 1 (1.3%) patient and cubitues varus deformity in the other one. Transient ulnar nerve palsy occurred in 3 (4.0%) patients which completely recovered in three months. Pin tract infection in 6(8.0%) patients, which resolved with local care and oral antibiotic. Deep infection and compartment syndrome were not encountered in our series.

DISCUSSION
Supracondylar fractures of humerus are one of the commonest childhood injuries and account for 60% of all fractures about the elbow in children. In the treatment of type-III fractures the main difficulty of closed reduction and casting is the need to hyperflex the elbow beyond 120° to maintain reduction, which is not always possible due to loss of radial pulse on hyperflexion. Failure to do so increases the risk of losing reduction, due to loss of supporting effect of the triceps muscle. Another difficulty in closed reduction is that coronal tilt is not always appreciated on radiograph, and the fact unveils itself only when deformity has already occurred.

The aim of surgical treatment is to safely create an adequately stable construct to prevent axial rotation and coronal or sagittal tilt to avoid post-operative deformity. Closed reduction and percutaneous K-Wires fixation is the treatment of choice for the reducible fracture, but percutaneous pin fixation needs image intensifier and is associated with iatrogenic ulnar nerve injuries.

Some surgeons would reserve ORIF for open fractures or for those associated with vascular injury, as there is 1.4% incidence of myositis ossificans and no neurovascular deficit. The results of our study were comparable to both local and international studies. In our study, excellent and good results of 93.3% are comparable to earlier studies of Kamath (92.5%), Philip (82%), Kumar (84%), Ababhneh (87%) and Umer (100%). Another study reported good to excellent results in 91.8%, similar to our results. Iatrogenic ulnar nerve injury was observed in 3 patients who recovered in three months without intervention. Overall patient satisfaction with regard to functional was excellent.

CONCLUSION
Type III SF need to be managed aggressively and ORIF of severely displaced SF of humerus is a safe option when a satisfactory reduction cannot be obtained by 2-3 attempts of closed method.
REFERENCES


