



## The outcome of early revision of malaligned pediatric supracondylar humerus fractures



Omer Or<sup>\*</sup>, Yoram Weil, Naum Simanovsky, Avraham Panski, Vladimir Goldman, Ron Lamdan

Hebrew University Hadassah Medical Centers, Department of Orthopedics Surgery, Jerusalem, Israel

### ARTICLE INFO

*Article history:*  
Accepted 13 April 2015

*Keywords:*  
Supra condylar humerus fracture  
Malalignment  
Revision

### ABSTRACT

*Background:* Supracondylar humerus fractures (SCHF) are the most common elbow fractures requiring surgical treatment in the pediatric age group. Most fractures are reduced and stabilised adequately. Yet, post-surgical malunion may occur. The purpose of this study is to evaluate our results of early revision surgery in 21 surgically treated pediatric SCHF with immediate postoperative loss of alignment and compare them with previous reports of late corrective osteotomies.

*Methods:* Twenty-one pediatric SCHF patients that underwent revision surgery for malalignment within 3 weeks of the initial reduction and fixation consisted the study group. Indications for revision were unacceptable radiographic alignment diagnosed within the first 3 weeks after the index surgery. Clinical outcome included pain, range of motion (ROM) and appearance of the elbow. Radiographic outcome was defined as fracture healing and final alignment, assessed in both coronal and sagittal planes.

*Results:* The average time interval between index and revision surgery was 7.6 days (range 3–18). In revision surgery, closed reduction was performed in 17 out of 21 patients, and open reduction was required in four. In one patient, an external fixator was added. In the most recent follow up, all patients but three regained full ROM. The remaining three had a deficit of 10° or less. Two patients had cubitus varus of 10° or less. All patients had a marked radiographic improvement after revision, especially in the sagittal plane increasing the humero-capitaller flexion angle by an average of 20°.

*Discussion:* Malunion after reduction and Kirschner wires (KW) fixation of SCHF is an uncommonly reported phenomenon. When malunion is recognised after fracture healing, corrective osteotomies may carry a significant complications rate. We describe our favourable experience with early diagnosis and revision surgery of malaligned SCHF.

© 2015 Elsevier Ltd. All rights reserved.

### Introduction

Supracondylar humerus fractures (SCHF) are the most common elbow fractures in children [1–3]. Closed reduction and percutaneous Kirschner wire (KW) stabilisation has been widely accepted as the preferred treatment of displaced pediatric SCHF.

Either medial and lateral crossed pinning or lateral pinning using two KW are the most commonly accepted methods for fracture fixation [4–6]. Complications after surgical treatment are uncommon and include infections, malunions, neurovascular injuries, elbow stiffness, and Volkmann ischemia [7–11]. The most common

deformities following SCHF malunion are cubitus varus in the coronal plane and hyperextension in the sagittal plane. Commonly, these are treated by means of a late corrective supracondylar osteotomy to improve cosmesis and prevent complications such as decreased elbow flexion or tardy ulnar nerve palsy [12].

As the most recent literature regarding the treatment of SCHF deal with the fixation constructs and whether lateral pins or crossed pin fixation should be used [13–16], very little is written about the diagnosis of postoperative malalignment prior to fracture healing [16].

However, the treatment of established, healed malunited fractures is well described and usually consists of a late, supracondylar osteotomy [17].

In our institution, we adopted a policy of early intervention in cases where unacceptable immediate postoperative malalignment was diagnosed.

<sup>\*</sup> Corresponding author at: Kiryat Hadassah, POB 12000, Jerusalem, 91120, Israel. Tel.: +972 508573961.

E-mail address: [or@hadassah.org.il](mailto:or@hadassah.org.il) (O. Or).

To the best of our knowledge, there are no recommendations regarding the optimal treatment of SCHF when malalignment is recognised early in the course of fracture treatment, specifically within three weeks following the injury and/or treatment. The aim of this study is to evaluate the outcome of early correction of malaligned, operatively treated SCHF and compare it with the published results of late corrective osteotomies.

## Patients and methods

### Patients

Following IRB approval, a retrospective chart review utilizing the hospital's computerised database was conducted. All children between 1 and 16 years of age who underwent closed or open reduction and percutaneous pinning of SCHF between 2000 and 2012 were identified. Inclusion criteria were Gartland type 2 or 3 SCHF with postoperative malalignment of the fracture requiring repeated surgery within 3 weeks following the index procedure.

### Malalignment

Since most children were placed in a splint with the elbow flexed at 90°, coronal plane deformity was difficult to assess using the Baumann angle. However, sagittal plane deformity was readily assessed using a true lateral fluoroscopy or postoperative radiograph in the cast.

Our criteria for revision included malalignment of over 10° in the coronal or sagittal planes. This was determined by directly measuring the humero-capitellar angle and, when possible, the Baumann angle. Failure of the anterior humeral line to intersect the capitellum was also an indication to unacceptable mal alignment.

**Surgical technique:** All patients except one were admitted originally to the authors' medical centre and were taken to surgery following admission. The primary procedure was usually performed by the general orthopedic surgeon on call. Closed reduction was attempted first followed by percutaneous fixation with KW either with 2 lateral or medial and lateral crossed pins. Open reduction was performed when closed reduction could not be obtained. Follow up by a fellowship trained pediatric orthopedic surgeon was started on the first postoperative day, and during a

clinic visit at one to two weeks postoperatively. All revision surgeries were performed by one of two senior pediatric orthopedic surgeons (RL, NS). Follow up clinic visits after the revision surgery were scheduled after 1, 3 and 6 weeks, 3 months, 6 months and 1 year. The KW were pulled out routinely 3 weeks following surgery when the cast was removed. A case example of an injury, fluoroscopy, 1 week and 3 weeks postoperative films is shown in Figs. 1 and 2. Clinical photo is shown in Fig. 3.

### Data collection and analysis

A chart and radiograph review was performed. Data was collected regarding original fracture pattern, surgical procedures and fixation geometry. Clinical outcome was recorded including complaints of pain, range of motion and elbow carrying angle. Radiographs were analysed for union and sagittal and coronal alignment.

### Statistical analysis

Statistical analysis was calculated utilizing SPSS version 20.0.

Descriptive statistics were calculated. The Wilcoxon signed rank test was used for non-parametric variable comparison tests. Correlation was estimated using the Pearson correlation test. A *p* value of 0.05 or less was considered statistically significant.

**Radiographic analysis:** Since one fellowship trained pediatric orthopedic surgeon preformed the measurements, intra-observer reliability was tested 6 months after the original measurements by re-measuring both Baumann and humero-capitellar flexion angles. Inter class coefficient (ICC) kappa value was calculated using 2-way ANOVA.

## Results

Out of 396 displaced SCHF that underwent surgical treatment, 20 fractures were revised within 3 weeks and were included in this study. An additional patient was transferred from another hospital with post-surgical malalignment. Of the 21 patients 16 were males and 5 female patients. Average age was 4 years and 6 months (range 2–10). In three patients the fracture was classified as Gartland type 2 and in 17 as type 3. In 18 patients the fracture was reduced by a closed technique during the initial surgery and in



Fig. 1. Diagnosis and initial treatment.

Download English Version:

<https://daneshyari.com/en/article/3238902>

Download Persian Version:

<https://daneshyari.com/article/3238902>

[Daneshyari.com](https://daneshyari.com)