

# A novel minimally invasive method in pediatric cubitus varus deformity, distal lateral humerus hemiepiphysiodesis: A case report

## Abstract

There is a relationship between cubitus varus deformity and the proximal ulna varus, and correction of this deformity during early childhood may prevent other morphological changes in the elbow. A 5 year 8 month old girl who developed cubitus varus deformity after supracondylar fracture. We publish the result of treatment with different surgical methods. Distal humerus lateral epiphysiodesis is a minimally invasive, reliable and quick surgical procedure that can correct cubitus varus deformity over time in children with sufficient growth potential, provided that the family and surgeon is patient, and prevent future morphological changes that may develop secondary to deformity.

**Keywords:** Cubitus varus • Deformity • Hemiepiphysiodesis

Submitted: 04 August 2021; Accepted: 18 August 2021; Published online: 25 August 2021

## Introduction

Cubitus varus is the most common complication in the treatment of supracondylar humeral fractures in children [1]. Although it is commonly considered benign deformity, chronic elbow pain, posterolateral rotational instability (PLRI), triceps snapping, ulnar neuropathy, progressive ulnar varus, progressive joint incompatibility, and increased risk of secondary fractures in lateral condyle or other bones have been described in adult orthopedic literature [1-5].

There is a relationship between cubitus varus deformity and the proximal ulna varus, and correction of this deformity during early childhood may prevent other morphological changes in the elbow.

Even in the absence of functional problems, which are mostly late sequelae, parents are often dissatisfied with the appearance of their child's arm and want it to be treated. Herein, we describe an easy to apply, minimally invasive and safe surgical technique to correct cubitus varus deformity in children. A statement of informed consent was taken by family of patient.

## Case History

A 5 year 8 month old girl presented to our outpatient clinic with a complaint of deformity and limitation of movement in the left elbow. Patient anamnesis revealed that she had received conservative treatment 3 months ago due to supracondylar humerus fracture. Physical examination showed a varus deformity in the left elbow, and there was a 20 degree flexion restriction; however, there was no restriction in extension.

A 22.4 degree varus deformity was detected in the left elbow on the bilateral elbow X-ray. Surgery was recommended due to limited mobility and cosmetic concerns of the family. Distal lateral humerus he-

miepiphysiodesis was planned and eight sets of plates were prepared. Antibiotic prophylaxis was performed preoperatively, and the bone was reached through a 3 cm incision from the distal lateral of the humerus under general anesthesia without applying a tourniquet.

Under scopy guidance, the location of eight plates to the distal humerus lateral was determined in anteroposterior and lateral fluoroscopy so that the distal screw would hold the capitellum epiphysis, and the plate was fixed to the bone using K-wire. First, the capitellum epiphysis was drilled, and a 3.5 mm cortical screw was sent. Thereafter, a screw was sent over the plate to the humerus distal avoiding the olecranon fossa after the drill.

Then, the patient was freed for elbow movements and discharged on postoperative day 1. Radiographic view and goniometric measurement of the elbow at 6, 12, 18 months were evaluated. Proximal ulna varus angle and humeroulnar angles were evaluated on the follow up radiographs of the patient at 1, 2, 6, 12, and 18 months.

## Discussion

Cubitus varus deformity can occur in children after supracondylar fractures of the humerus and lateral condyle fractures. Various etiological reasons have been proposed. Osteonecrosis is rare regardless of the absence or presence of growth arrest, but it is an important cause of varus deformity.

Although it is defined as a simple varus deformity of the elbow; in reality, it is a three dimensional deformity comprising varus in the coronal plane, extension in the sagittal plane, and internal rotation in the axial plane [2]. Cubitus varus deformity is traditionally defined as a cosmetic deformity in children, characterized by slight, if any, pain and dysfunction.

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The timing of deformity correction is controversial because these fractures usually occur long before the skeleton matures. In children, it is easier to correct deformities than in adults due to the ongoing remodeling and flexibility of deformity as a byproduct of skeletal immaturity. Pediatric orthopedists should reconsider the long standing belief “cubitus varus is only a cosmetic deformity.” Correction of the deformity during childhood can prevent the formation of late sequelae such as PLRI, ulnar neuropathy, and chronic pain that may occur in adults.

Although O’Driscoll et al. did not find a relationship between the degree of varus deformity and age in their case series, another study concluded that there is a relationship between increased proximal ulna varus and cubitus varus, and correction during early childhood may prevent future morphological changes in the elbow [2, 5].

Presently, there is no gold standard surgical treatment for the correction of cubitus varus. Solfelt et al. reviewed 40 studies evaluating the results of 894 children who underwent surgical treatment for cubitus varus and reported that no surgical technique was safer or more effective than others, and the average complication rate was 14.5% (10.6%–18.5%).

We believe that elbow varus deformity, like genu varus and/or valgus, can be corrected with distal humerus lateral hemiepiphyseodesis, which is a minimally invasive and safe surgical method, even if it takes a long time.

Although the capitellum is the secondary ossification center in the elbow that starts to ossify first, it can only be seen radiologically around the age of 2 years. In their MRI study, Lee et al. showed that the capitellar ossification center covers 76% of the transepicondylar distance only around the age of 5–6 years. Therefore, we think that the child must be of at least 5 years to send screws to the capitellar ossification center.

Because epiphyseodesis or hemiepiphyseodesis cannot provide acute correction, they should not be performed in children and families with an expectation of acute correction, and the family and child should be informed about this issue.

Distal humerus growth differs from the tibia and femur. Although 75% of femur growth is distal and 57% of the tibia is proximal, annual growth potentials are 10 mm/year for the femur and 6.4 mm/year for the tibia on average. However, although the average annual growth of the humerus is close to the femur, 80% of its growth is from the proximal physis, and only 20%–25% can be distal. Therefore, it is expected that a varus deformity in the elbow will improve in a much longer period of time than a deformity in the knee.

The lateral epicondyle secondary ossification center begins to

appear radiologically around the age of 11–12 years. We believe that it would not be effective in cases with cubitus valgus because its growth potential would be considerably decreased.

The 18 month follow up results in our case showed that, as HEWA and carrying angle improved in time, proximal ulna varus angle also approached normal limits in parallel.

## Conclusion

We believe that distal humerus lateral epiphyseodesis is a minimally invasive, reliable and quick surgical procedure that can correct cubitus varus deformity over time in children with sufficient growth potential, provided that the family and surgeon are patient, and prevent future morphological changes that may develop secondary to deformity.

## Informed Consent

Written informed consent was obtained from patient who participated in this study.

## Conflict of Interest

The authors have no conflicts of interest to declare.

## Financial Disclosure

The authors declared that this study has received no financial support.

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