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Case Report

Case report of step cut osteotomy for cubitus varus: a superior surgical technique

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ABSTRACT

Lateral closing wedge osteotomy is a commonly described procedure for correcting cosmetically unacceptable post-traumatic cubitus varus deformity in children. We report a case of 12-year-old boy who underwent step cut osteotomy for cubitus varus deformity. Preoperative measurements of varus deformity followed by planning of osteotomy using a template was done. Intraoperatively the preplanned cuts were made using a posterior approach and then fixation was done using k wire. Patient recovered completely with correction of deformity. Step cut osteotomy has key advantages over traditional closing wedge osteotomy and hence can be used as an alternative surgical technique.

Keywords: Step cut osteotomy, Cubitus varus, Lateral closing wege osteotomy, Deformity correction, Surgical technique

INTRODUCTION

Supracondylar fracture of humerus is a very common pediatric fracture frequently occurring in the first decade of life.[1] Gun stock deformity (cubitus varus) is described as one of the most common complications occurring in association with supracondylar fracture whether treated operatively or conservatively.[2] Different types of corrective osteotomies are performed to treat this deformity and one of the most popular one is lateral wedge closing osteotomy. Step cut osteotomy is a supracondylar distal humerus osteotomy where lateral spike is left in the distal fragment. It is not a novel technique but infrequently done. We are discussing the case of a child treated with step cut osteotomy, the surgical technique used and its advantages.

CASE REPORT

A 12-year-old boy presented with cubitus varus deformity (also known as gun stock deformity). The child had a history of supracondylar humerus fracture which was treated conservatively at the age of 5 years by general practitioner. On examination the deformity was cosmetically significant with no movement restriction or neurological abnormality. Ulno-humeral angle was measured to be 20 degrees both clinically and radiographically and hence, decision was made for varus correction osteotomy (Figures 1 and 2).

Figure 1: Clinical image showing varus deformity.

Figure 2: Radiograph of elbow of varus deformity.

Surgical technique

Preoperative planning is the first step of step cut osteotomy. At first a template is made on a paper depicting the deformity of the distal humerus and Humeral-ulnar - wrist angle is measured (Figure 2 A), which was 20-degree varus in this case. Similarly using radiographs as reference, normal valgus angle of the normal limb is also calculated, which was 8 degrees in this case. Thus, the required correction was estimated to be 20+8=28 degrees to get the gun stock deformity corrected to patient's normalcy.

The next step is to draw a straight line XY, perpendicular to the lateral supracondylar ridge to medial supracondylar area approximately 1.5 to 2 cm proximal to the olecranon fossa as shown in Figure 2B. Then a second line YZ is drawn starting from Y on the medial supracondylar area at an angle equal to the required correction needed and of the same length as XY as shown in Figure 2 C. Finally, points X and Z are connected. Now the triangle of bone within XYZ is removed and proximal humerus is fitted into the resulting wedge defect (Figure 2 D).

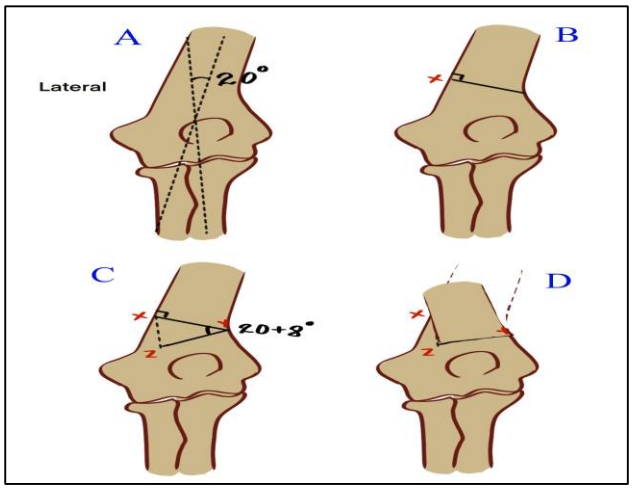

Figure 3: Preoperative planning using a template for step cut osteotomy.

Patient was placed in lateral position with the arm overhanging over a support with elbow 90 degree bent. Standard posterior approach to distal humerus was utilized and triceps was split to expose the supracondylar area. According to the preoperative template planning, triangle XYZ was made and marked with electrocautery (Figure 4). Then using a 2.5 mm drill bit, multiple drill holes are made along the marked line taking care not to over drill thereby preventing damage to anterior neurovascular structures (Figure 5). Now the drill holes are connected using s sharp osteotome and triangular piece of bone was removed leaving behind a step cut with a lateral spike on distal fragment (Figure 6). The lateral aspect of proximal fragment is made raw for faster healing and then approximated to achieve the required correction of the deformity. Multiple K wires were used to transfix the fragments in the corrected position (Figure 7 and 8). Lag screw or plates can also be used for the same.

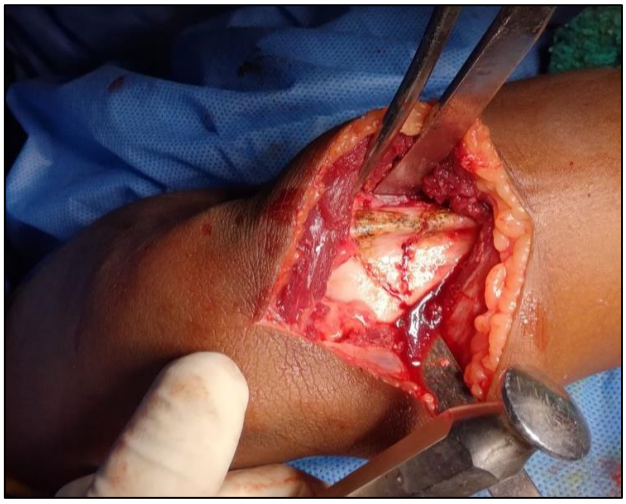

Figure 4: Intraoperative image showing osteotomy lines marked with electrocautery.

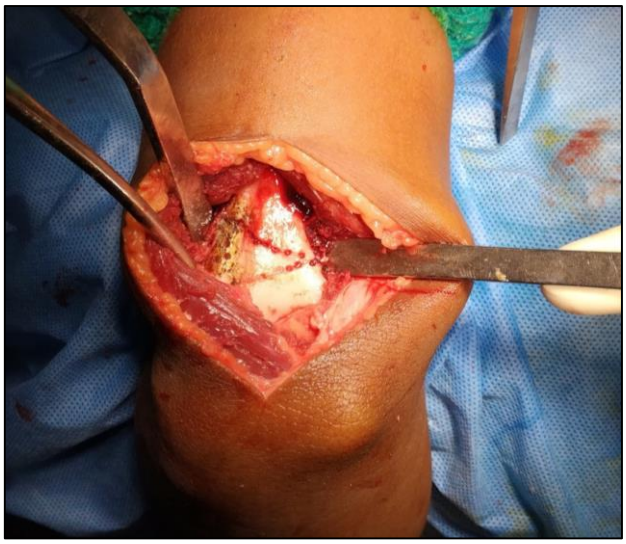

Figure 5: Multiple drill holes placed along the marked lines for osteotomy.

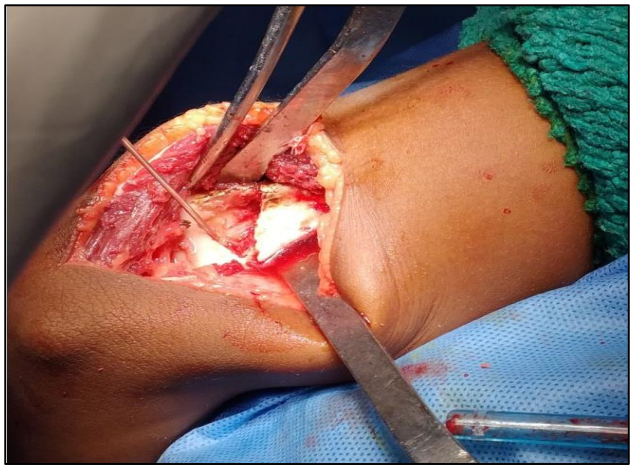

Figure 6: Triangular piece of bone removed.

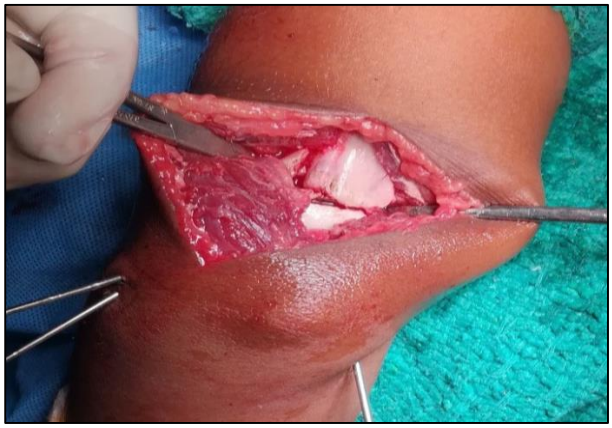

Figure 7: Fragments transfixed with multiple k wires in position.

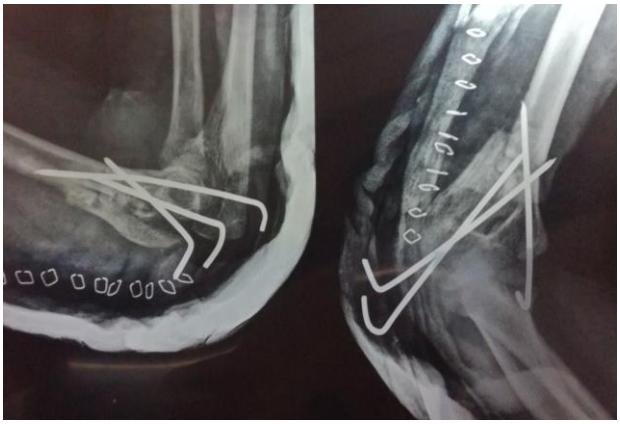

Figure 8: Postoperative radiograph showing well positioned fragments fixed in correction with k wires *in situ.*

DISCUSSION

Cubitus varus is one of the most common complications of supracondylar humerus fractures in children which results as a consequence of malunion, including medial tilting, extension and internal rotation of the distal fragment. Though, the deformity rarely causes any functional loss, poor aesthetic appearance can sometimes warrant a need for correction. The supracondylar corrective osteotomy which is popular among surgeons is lateral closing wedge osteotomy. This technique has been considered to be simple but is not without any drawbacks.[3] Incomplete deformity correction, undue lateral epicondyle prominence, nerve palsies and failure of fixation are few of the complications associated with it.[4]

This led to the development modifications of lateral closing wedge osteotomies by several surgeons. A valgus step-cut osteotomy with single screw fixation was described by DeRosa and Graziano in 1988 to correct cubitus varus deformity in a study of eleven children.[5] Later on in 1998, Kim et al successfully treated 31 gunstock deformity patients with step cut osteotomy using Y shaped humerus plate fixation.[6] A study by Bali et al in 2011 involving 14 cases utilizing step cut osteotomy with a posterior plating revealed superior results. This study demonstrated that lateral spike was preventing translation with reduced incidence of loss of correction and increased area of contact for union.[7]

Although several corrective osteotomies have been enumerated in literature, there has never been a consensus on which technique is superior. While step cut osteotomy is useful in correcting deformity in sagittal plane, rotational deformities can only be partially corrected.[8] This can be achieved by rotating the distal fragment backwards, using the medial hinge as a fulcrum. However, higher degrees of rotational correction can compromise area of contact and may lead to failure.

CONCLUSION

Step cut osteotomy is a simple and reproducible surgical technique for corrective osteotomy which if done properly can provide superior results. However, studies with larger sample size comparing with traditional surgical techniques to assess the long-term advantages are yet to be done.

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