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Original Research Article

Modified supracondylar dome osteotomy: our experience in 11 children

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ABSTRACT

Background: The present retrospective study was done with 11 children having cubitus varus following supracondylar fractures to access the stability of modified domeosteotomy and its fixation with k-wires in older children.
Methods: 11 children, 7 males & 4 females were included in the study. The osteotomy was performed through posterior approach. The triangular wedge rotated inside the notch was inherently stable and also fixed with k-wires. Patients were followed at regular intervals. K wires were removed at 6 weeks and the physiotherapy started.
Results: The correction obtained under vision was well maintained post operatively in 10 out of 11 cases. In only one case there was back out of k-wires and loss of correction. 5 cases had excellent result followed by 4 good and one fair result.
Conclusions: Modified dome osteotomy performed through posterior approach and fixed with k-wires gives good results. Removal of the k-wires is simple. However, in children above 14 years plate fixation might be better to prevent loss of correction.

Keywords: Modified supracondylar dome osteotomy, K-wires, Cubitus varus, Posterior approach

INTRODUCTION

Supracondylar fracture of humerus is the most common pediatric fracture, typically occurring in children during the first decade of life.[1-4] Cubitus varus is the most common delayed complication that results following supracondylar fracture of humerus in children. Immediate and late causes of cubitus varus deformity are medial angulations, medial rotation, overgrowth of lateral condyle and osteonecrosis or delayed growth of medial condyle. The medial angulation is the major determinant for the deformity while medial rotation contributes to it.[5]

The traditional supracondylar osteotomy (French osteotomy) still commonly practiced by surgeons worldwide is the lateral closing wedge osteotomy with the two screws and a figure of eight tension band wire attached between them. Srivastava et al, supplemented the fixations with two lateral K-wire and claimed better results.[6] The clinical results following this procedure, however, have been disappointing in some series, with reported undercorrection rates being high.[7-8] This osteotomy inadequately addresses rotational component of deformity and has a tendency for prominent lateral condyle compromising the cosmetic result.[3] Also the hyper trophic scar resulting from the lateral approach often jeopardizes their expectation. Loss of correction (recurrent varus) is also seen in some of the cases.

We describe our experience with modified supracondylar dome osteotomy in 11 children that produced a very satisfactory result.

METHODS

Between January, 2011 and December, 2013, 11 children, 7 males and 4 female were included in the study. A written informed consent was taken from all the parents prior to surgery. A detailed clinical and radiological assessment of both elbows was done. Carrying angle on both sides were measured by goniometer clinically and humeral-elbow-wrist angles on AP radiographs of supinated and extended forearm (Figure 1). Only patients with cubitus varus of more than 20° were included in the study. The range of elbow movement was measured on both sides and recorded accordingly. After clinical evaluation and investigations surgery was planned.

Figure 1: Pre-operative AP X-ray of both elbow and forearm showing negative carrying angle of left side.

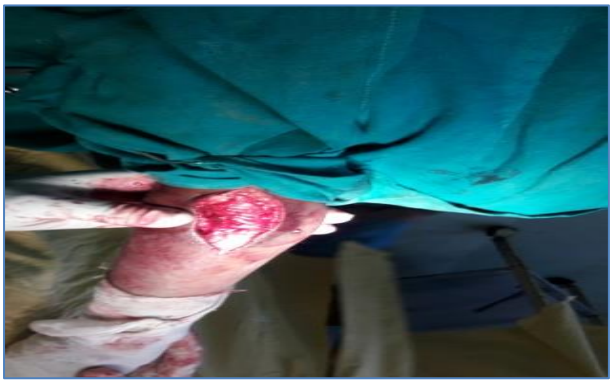

Figure 2: posterior midline exposure with triceps reflection.

The surgery was performed through standard posterior approach by elevating the triceps, from the triceps brachioradialis junction and exposing the posterior surface and lateral border of humerus (Figure 2). A horizontal line was marked about 5 mm above the olecranon fossa. A triangle was marked with the apex in the mid line about 1cm above the centre of the horizontal line and base as the horizontal line. Multiple drill holes were done between the apex and two ends of the horizontal lines. The osteotomy was completed using a saw. With the elbow in full extension, the lateral corner of the distal fragment was rotated inside the notch by moving the forearm till correction was obtained under vision (Figure 3). At times the apex of the distal fragment had to be gently nibbled to allow adequate rotation of distal fragment. Usually at this point the distal fragment was inherently stable in the triangular notch. Fixation was done with crossed K-wires. An additional K-wire was inserted from the lateral side. The wound was closed and dressing done. POP slab was given for 3 weeks with elbow in 90° flexion. After 3 weeks the slab was removed, clinical and radiological assessment done and gentle elbow mobilization started. K wires were removed after 6 weeks and vigorous physiotherapy started. Patients were assessed at an interval of 14 days for 6 weeks and then at monthly interval for 3 months. Final assessment was done at the end of 1 year including the carrying angle, lateral condylar prominent index and range of movement on both sides (Figure 4). Condition of scar, any loss of correction and complications such as nerve injury, migration of pins were also noted. All descriptive variables were expressed as frequency and percentage with range. Wherever possible means were calculated and expressed. No comparative analysis was done.

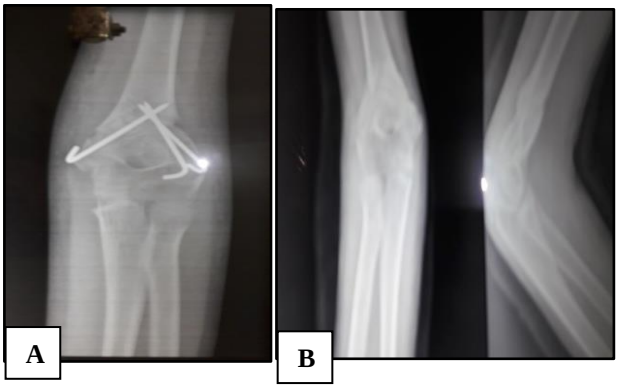

Figure 3: A) Postoperative x-ray showing good correction, B) remodelling with maintained correction after 1 year.

Figure 4: Comparative carrying angles of both elbows after correction.

RESULTS

Between January, 2011 and December, 2013 a total of 11 children with cubitus varus deformity were included in this study. There were 7 boys and 4 girls with left sided preponderance 7:4. The mean duration of trauma was 3.5 years, (range 2 to 5 years). The mean age of the children was 11.5 years (9 to 14 years) (Table 1). Patients with cubitus varus of less than 20° were not included in the study. The average varus deformity was 26° (range 25° to 28°). Post operatively, the average carrying angle obtained was + 12° to 15° (Table 2). The range of elbow flexion was 0° to 110° (near pre-operative status). There was loosening of pins and loss of correction in one case. Superficial infection was found in 1 case which healed with dressing and antibiotic (Table 3). No lateral condylar prominence was present in any of the cases. Functional results were excellent in 5, good in 4, fair in 1 and poor in1 case.

Table 1: Pre-operative patient demographics.

Gender	Numbers	Percentage (%)
Male	7	63.63
Female	4	36.36
Affected side		
Right	4	36.36
Left	7	63.63
Mean duration from fracture	3.5 years	
Mean age of patients	11.5 years	

Table 2: Pre and post-operative mean carrying angle.

	Pre-operative mean	Postoperative mean
Carrying angle	-15°	+13°

Table 3: Complications in our series.

Superficial infection	**1**
Migration / back out of pins	1
Loss of correction	1

Table 4: Functional results.

Result	Grade
Excellent	**5**
Good	4
Fair	1
Poor	1

DISCUSSION

Close reduction and percutaneous pinning has become the Gold Standard of treatment for extension type of supracondylar fractures. However, this procedure is technically demanding and needs good infrastructure and surgical expertise. Incidence of cubitus varus still remains high both in surgically treated and neglected cases. Corrective supracondylar osteotomy for post-traumatic cubitus varus is performed mainly for cosmesis and not for function.[5,9,10] Presence of large number of methods itself explains the inadequacy of the techniques. The classical lateral closing wedge osteotomy of French modified by many authors using different fixations techniques have claimed good results. However, recurrent varus and high Lateral condylar Prominent Index are often present. Step cut osteotomy or multi planer osteotomy were developed as a result to overcome the shortcomings but need a meticulous templating and adherence to the technical details. In our method placement of distal fragment inside the notch is inherently stable and correction could be monitored on table with controlled rotation of the distal fragment. Fixation with K-wires proved sufficient, as area of contact at osteotomy was high and it was inherently stable. Removal of the K-wires at the end of 6 weeks was simple. The Lateral condylar Prominence Index was low and the patients were satisfied along with their parents. However, in older children (above 14 years) fixations with plates might be better as one loss of fixation with poor result in our series was also in a child older than 14 years.[1,2]

CONCLUSION

In our short experience of 11 cases, modified dome osteotomy with K-wire fixations has proved satisfactory. The correction of the carrying angle is under our control and assures better result. It also avoids a second operation (for removal of implants). Lack of prominence of the lateral condyle and posterior placement of scar adds to its cosmetic benefit. The functional results are good and we recommend this procedure in children under 14 years of age.

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