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Lateral closed wedge osteotomy for cubitus varus deformity

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Abstract

Background: Lateral closed wedge (LCW) osteotomy is a commonly accepted method for the correction of the cubitus varus deformity. The fixation of osteotomy is required to prevent loss of correction achieved. The fixation of the osteotomy by the two screw and figure of eight wire is not stable enough to maintain the correction achieved during surgery. In this prospective study we supplemented the fixation by Kirschner's (K-) wires for stable fixation and evaluated the results.

Materials and Methods: Twenty-one cases of the cubitus varus deformity following supracondylar fractures of the humerus were operated by LCW osteotomy during February 2001 to June 2006. The mean age of the patients at the time of corrective surgery was 8.5 years (range 6.6-14 years). The osteotomy was fixed by two screws with figure of eight tension band wire between them and the fixation was supplemented by passing two to three K-wires from the lateral condyle engaging the proximal medial cortex through the osteotomy site.

Result: The mean follow-up period was 2.5 years (range seven months to 3.4 years). The results were assessed as per Morrey criteria. Eighteen cases showed excellent results and three cases showed good results. Two cases had superficial pin tract infection.

Conclusion: The additional fixation by K wires controls rotational forces effectively besides angulation and translation forces and maintains the correction achieved peroperatively.

Keywords: Cubitus varus deformity, fixation technique, lateral condylar wedge osteotomy

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Introduction

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. ^[1] The medial angulation is the major determinant for the deformity ^[2] while medial rotation contributes to it.

There are several fixation techniques of corrective osteotomies of the distal humerus. The medial opening wedge osteotomy leads to instability and stretching of the ulnar nerve, and is difficult to fix. ^[3] Lateral close wedge osteotomy (LCW) is the easiest, safest and inherently the most stable osteotomy. The dispute lies in the type of fixations which are most stable with minimum complications. The two screws and a figure of eight tension band wire attached between them, plate fixation, crossed Kirschner's (K-) wires, staples, external fixation and even no fixation are described in the literature. Roach *et al.*, ^[4] reported the recurrence of deformity because of non-rigid fixation with K-wires and recommended the lateral two-hole plate and percutaneous medial pins to increase the stability. Oblique osteotomy fixed with cortical screws was also described by Amaspacher and Messenber. ^[5] Three-dimensional osteotomy was described by Uchida, Ogota and Sugioka. ^[6] Voss *et al.*, ^[7] did uniplanar supracondylar closing wedge osteotomy and fixed it with pre-set K-wire. French ^[8] advocated lateral closing wedge osteotomy and fixation with two screws with figure of eight tension band wire between them. Bellemore ^[9] modified French's technique by leaving the medial cortex short of the periosteum and fixing it like French's technique. Derosa and Gaziano ^[10] reported good to excellent results after step-cut osteotomy and fixation with cortical screws. Sharma *et al.*, ^[25] had performed pentalateral osteotomy; Rai ^[26] used valgus rotation osteotomy; Levine *et al.*, ^[11] Usai *et al.*, ^[12] Handelsman *et al.*, ^[21] Jain *et al.*, ^[22] and Goyal *et al.*, ^[23] used unilateral external fixator to stabilize distal fragment after wedge osteotomy; Agarwal *et al.*, ^[24] used biaxial external fixation; Song *et al.*, ^[13]

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In the present prospective study we are reporting our experience in 21 cases treated by lateral closed wedge osteotomy and fixed by two screws and figure of eight tension band wire. The fixation was supplemented with two lateral K-wires.

Materials and Methods

Twenty-one cases of cubitus varus deformity following supracondylar fracture of the humerus, out of which 12 were male and nine were females, had been corrected by lateral close wedge osteotomy between February 2001 and June 2006. The osteotomy was first fixed by two screws and figure of eight tension band wire around them followed by supplementation of fixation with two to three K-wires passed through the lateral condyle up to the proximal medial cortex. The mean age at the time of injury was six years (range four to nine years) and at the time of corrective surgery was 8.5 years (range 6.6 to 14 years). Patients presented to us with loss of flexion by mean 11 degrees (range 0-20°) and two patients with hyperextension deformity of 14 and 16 degrees respectively. Clinically carrying angle was measured by angle formed between long axis of arm and forearm. The affected elbow was examined and compared with the contralateral side. Standard true anteroposterior and lateral radiograph of affected and normal elbow in identical position were used to assess the deformity and to do templating in every case. Radiologically, the humero-ulnar angle was taken into account. A varus angle of more than 10 degrees measured on radiograph and cosmetic complaints were considered as an indication for surgery. Preoperative templating has been done in each case. The cases in the relatively younger age group had been observed for a period of six months at monthly intervals, and had been assessed clinically and radiologically for any increase in deformity before contemplating surgery on them to exclude osteonecrosis or the overgrowth of any condyle. The cases were operated only when the deformity was considered static for six months in the follow-up before the age of 10 years. Postoperative radiographs were assessed at 1, 3, 6, 12 months time to assess the maintenance of correction achieved postoperatively.

The assessment of the outcome of the cases was done on the basis of Morrey [14] criteria [Table 1].

Operative procedure

After giving appropriate anesthesia, tourniquet was applied. The patient was positioned supine with the arm on a hand table. Posterolateral skin incision was made along the lower arm. The lateral third to half of the triceps muscle was reflected from its insertion. The osteotomy site was marked on the humerus with the help of the template which determines the length of the lateral wedge and angle of osteotomy. The desired correction was calculated by adding the differences of humero-ulnar angle of both elbows and adding normal valgus angle of normal elbow. The K-wire was inserted parallel to the proposed osteotomy site, one proximally and one distally. After checking the placement of K-wires under the C-arm, two cortical screws, one proximally and the other distally, were inserted parallel to the two K-wires. After removing measured wedge, the fragments were aligned with the help of pre-placed K-wires rather than aligning them by manipulating the forearm which usually does not provide the controlled force at the fracture site and may lead to break in the medial cortical hinge, and in turn to instability of fixation. The fixation had been secured with the help of figure of eight tension band wiring loop around the screws' heads after achievement of reduction of osteotomy and comparing it clinically with other elbow in full extension. This fixation was supplemented by two K-wires inserted from the lateral condyle passing through the osteotomy site and engaging the opposite proximal medial cortex [Figure 1]. The wound was closed and the above elbow plaster of paris slab was applied. Stitches were removed after 10 to 12 days of operation. Details about the 21 cases, including age, sex, follow-up period, rehabilitation period, carrying angle correction pre- and postoperatively are given in [Table 2].

Result

The 21 cases were followed up to a mean period of 2.5 years (range seven months to 3.4 years). Twenty cases were fully satisfied with cosmetic results, but one case (no 10) had complaint related to cosmetic appearance. All the cases resumed their normal activity within three to six months of surgery. The radiological union at the osteotomy site took place in a mean period of 6.5 weeks (range 5.5 to 8 weeks). Preoperative mean loss of flexion of 11 degrees (range 0 to 20) reduced to mean of 3 degrees (range 0 to 5 degrees). The hyperextension in two cases by 14 and 16 degrees improved to normal postoperatively. The supination, pronation of forearm was same pre- and postoperatively. There was no pain in 16, mild pain in three, moderate pain in two cases and none had severe pain. A total of 20 patients (95%) were satisfied with the cosmetic appearance while one (case no. 10) (5%) noticed little difference due to excessive lateral condylar prominence. Of the 21 patients, 19 were able to have full range of motion after a mean of 6.8 weeks (range 5.5 to 8.4 weeks), while two patients regained at 9 and 10 weeks respectively. No case had instability in the coronal plane.

Eighteen (85%) patients showed excellent results, three (15%) good while none showed fair or poor results in the follow-up. Statistical analysis was not done due to the small study group. None of our patients had any neurovascular deficit postoperatively. There was superficial pin tract infection in two cases (case no.7 and 13) but it responded to local wound care and antibiotics. None reported pin loosening, gross loss of fixation, and loss of correction. The comparison of the results of various other methods with our method is given in [Table 3]

Average preoperative varus was 20.1 degrees (range 16-25), immediate postoperative and 12th week postoperative valgus angle measured 14.4 degrees (range 12-17 degrees). The radiological valgus achieved on the operated side was near equal to valgus of normal side with a mean variation of ± 1.91 degrees (range - 2 in case no. 20 to + 4 degrees in case no. 10 at 12-week follow-up [Table 2]).

Cosmetically all were satisfied with the outcome. There had been no neurovascular complication, unsightly scar or any residual deformity. Stable fixation had led our most of the cases to achieve >170 degree of supination- pronation, <5-10 degrees of restriction of flexion-extension in the majority of the cases [Figure 2]. Most of our patients were able to regain their pre-injury functional status in the ninth week postoperatively with excellent cosmetic correction.

Discussion

Lateral close wedge (LCW) osteotomy is the easiest, safest and inherently stable method of correction. The type of fixation of osteotomy is a concern to achieve good result. Roach *et al.*, [4] believed that unstable, non-rigid fixation led to slip of the fragments and loss of correction. Various methods of fixation are: use of two screws and figure of eighth tension band wire attached to them, plate fixation, cross K-wire fixation, staples; few authors used no fixation. The fixation by crossed K-wires frequently led to loosening of the fixation with recurrence of deformity, [10] pin tract infection [18] skin slough, [3] nerve palsy [3],[18] and rarely brachial artery aneurysm.

This modification reported by us to stabilize lateral closed wedge osteotomy for the cubitus varus deformity has certain advantages. We have used two K-wires in addition to two screws with TBW at the osteotomy site which gives us more control on the proximal and distal fragments which avoids the fracture of the medial cortex after closing the osteotomy. In addition, on peroperative clinical evaluation it gives better control of translation, rotation and angulations. Thus this method of fixation reduces the chance of the recurrence of the deformity. We respected the periosteum by not stripping it too much, thus giving the osteotomy more biological environment for fast healing. Experience has shown that the biological determinants of fracture healing are as important as the mechanical and must be respected. [15]

The K-wires were passed across the osteotomy site when the elbow was in position of full extension thus ensuring that there was no mechanical block postoperatively for regaining full elbow movements. In two cases with hyperextension deformity, the K-wires were passed when the elbow was at zero degree of extension; an appropriate anterior wedge was also removed before the fixation of osteotomy.

Roach *et al.*, [4] recommended two-hole plates on the lateral site and two K-wires from the medial side for providing stable fixation but this produced more nerve palsies and two-hole plate does not give the strong axial hold to the proximal and distal fragments. We had no nerve palsies in our study. According to Sang *et al.*, the maintenance of early movement during treatment in order to obtain good functional results is the most important consideration. This problem is encountered when prolonged cast immobilization is required if the fixation is bio-mechanically not stable. In our study the addition of two K-wires, residual medial cortical hinge and the two screws with wires around them had made the fixation more stable and no loss of correction occurred. None had reported poor cosmetic result till the recent follow-up except one case (no-10) due to lateral condylar prominence.

We believe that the modified method of fixation is a simple reliable, acceptable and effective method. In our series using this fixation method, peroperatively achieved correction is not lost till the union is achieved.

References

1. Kasser JR, Voss FR. Uniplanar Supracondylar osteotomy with pre set K-wire for cubitus varus. J Paediatr Orthop 1994;14:47. †
2. Smith C, Oppenheim WL, Clader TJ. Supracondylar osteotomy for traumatic childhood cubitus varus. Clin Orthop Relat Res 1984;188:32-9. †
3. King D, Secor C. Bow elbow. J Bone Joint Surg Am 1951;33:572-6. † [PUBMED]
4. Roach JW, Hernandez MA 3rd. Corrective osteotomy for cubitus varus after Supracondylar fracture. J Paediatr Orthop 1991;14:187-91. †
5. Amspacher JC, Messenbaugh JE. Supracondylar osteotomy of the humerus for correction of rotational and angulation deformity of elbow. South Med J 1964;57:845. †
6. Uchida Y, Ogota K, Sugioka Y. A new three dimensional osteotomy for cubitus varus deformity following Supracondylar fracture of humerus in children. J Paediatr Orthop 1991;11:327. †
7. Voss FR, Kesser JR. Preset K wires and incomplete osteotomy. J Paediatr Orthop 1994;14:474. †
8. French PR. Varsus deformity of elbow following Supracondylar fracture of humerus in children. Lancet 1959;2:439. † [PUBMED]
9. Bellemore MC, Barret LR, Middleton RW. Supracondylar osteotomy of the humerus for correction of cubitus varus. J Bone Joint Surg Br 1984;66:566-72. †
10. Derosa GP, Graziano GP. A new osteotomy for cubitus varus. Clin Orthop Relat Res 1988;236:160-5. † [PUBMED] [FULLTEXT]
11. Levine MJ, Horn BD, Pizzutillo PD. Treatment of post traumatic cubitus varus in paediatric, population with humeral osteotomy and external fixator. J Paediatr Orthop 1996;16:597-601. †
12. Usai M, Ishii S, Miyano S, Narita H. Three dimensional osteotomy for cubitus varus after Supracondylar fracture of humerus in children. J Paediatr Orthop 1991;11:327-31. †
13. Song SR, Cho SH, Jeong ST, Park YJ, Koo KH. Supracondylar osteotomy and Ilizarov's fixation for elbow deformity in adults. J Bone Joint Surg Br 1997;79:748-52. †
14. Morrey BF. Post-traumatic contracture of the elbow: Operative treatment, including distraction arthroplasty. J Bone Joint Surg Am 1990;72:601-18. † [PUBMED]
15. Muller M, Allgower M, Schneider R, Wflengger H. Manual of internal fixation. 3rd ed. Berlin etc: Springer; 1991. †
16. Rang M. Childrens fracture. Philadelphia: JB Lippincot; 1974. †
17. Piggot J, Graham HK, McCoy GF. Supracondylar fractures in children, Treatment by straight lateral traction. J Bone Joint Surg Br 1986;68:577-83. † [PUBMED] [FULLTEXT]
18. Oppenheim WL, Caider TJ, Smith C, Bayer M. Supracondylar humeral osteotomy for traumatic childhood varus deformity. Clin Orthop Relat Res 1984;188:34-9. †
19. Kannujia RR, Ilcuta Y, Muneshige H, Higaki T, Shimogaki K. Dome osteotomy for cubitus varus in children. Acta Orthop Scand 1988;59:314-7. †

20. Karatosun V, Alekberov C, Alici E, Ardin CO, Aksu G. Treatment of cubitus varus using the Ilizarov technique of distraction osteogenesis. *J Bone Joint Surg Br* 2000;82:1030-3. [↑](#)
21. Handelsman JE, Weinberg J, Hersch JC. Corrective supracondylar humeral osteotomies using the small AO external fixator. *J Pediatr Orthop B* 2006;15:194-7. [↑](#) [\[PUBMED\]](#) [\[FULLTEXT\]](#)
22. Jain AK, Dhammi IK, Arora A, Singh MP, Luthra JS. Cubitus varus: Problem and solution. *Arch Orthop Trauma Surg* 2000;120:420-5. [↑](#) [\[PUBMED\]](#) [\[FULLTEXT\]](#)
23. Goyal RK, Chanda H, Pruthi KK, Sharma A. External fixator after corrective osteotomy for cubitus varus. *Indian J Orthop* 1997;31:159. [↑](#)
24. Agarwal NK, Agarwal G, Mishra AK. Bi axial external fixations of corrective osteotomy in cubitus varus. *Indian J Orthop* 1998;32:147. [↑](#)
25. Sharma S, Modi U, Sangwan SS, Mudgal KC. Pentalateral osteotomy for correction of cubitus varus. *Indian J Orthop* 1995;29:52. [↑](#)
26. Rai PK. Correction of cubitus varus by supracondylar valgus osteotomy. *Indian J Orthop* 1988;22:169. [↑](#)

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**Figures**

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