



## CLINICAL STUDY OF A NEW TECHNIQUE FOR CORRECTION OF CUBITUS VARUS DEFORMITY

**Dr.Kumar Nitesh**

**Dr.Shanawaz Hussain**

**Dr.Bimlesh kumar bimal**

**Dr.Shailesh kumar\***

Senior Resident, Deptt of orthopaedics IGIMS Patna

Senior Resident, Deptt of orthopaedics IGIMS Patna

Deptt of orthopaedics IGIMS Patna

Deptt of orthopaedics IGIMS Patna\*Corresponding Author

### ABSTRACT

**Background-** Cubitus varus causing a reduction or loss of carrying angle remains one of the commonest complication of supracondylar fractures. Despite the numerous ways are described of treating supracondylar fracture, cubitus varus remains a significant problem. It can only be prevented by achieving and maintaining accurate reduction. Cubitus varus deformity is not a functional problem, but it may become so disfiguring that correction is indicated. **Methods-** A total of 10 cases of cubitus varus deformity were treated with modified French osteotomy outcome was measured with by the method of oppenheim WL. **Conclusion-** cubitus varus is the most common complication of supracondylar fracture of the humerus it is nearly always secondary to uncorrected or recurrent medial tilting of the distal fragment of the fracture. corrective supracondylar osteotomy is indicated only for children with unacceptable comesis. Modified French method proved safe and satisfactory as it has improved anatomy and cosmetic results. Loss of correction of cubitus varus deformity does not occur.

### KEYWORDS

Osteotomy, preventable, cubitus varus deformity

### INTRODUCTION

Cubitus varus deformity is the most common late complication after supracondylar fracture of distal humerus in children, incidence varying from 4 to 58%. Elbow injuries are common in skeletally immature children, between 5-10 years of age. metaphyseal area of the humerus is the easiest region around the elbow, so supracondylar fractures are the most common elbow injuries. Also the frequent falls in small children while playing, cycling or falls inside the house from bed, sofa added to the increase in incidence. Non dominant side and boys have a more predilection to such injuries than dominant side and girls. Associated vascular injuries in 1% of the cases and nerve injuries involving median and radial nerve in atleast 7% of the cases adds to the concern increased ligamentous laxity also correlates with the occurrence of supracondylar fracture. Different methods have been used for the treatment of supracondylar fractures. Most can be reduced by manipulation and closed reduction, some require open reduction. Adequate reduction is assessed fluoroscopically by baumanns angle formed by the physal line between the lateral condyle and the line touching distal humeral articular margin and perpendicular with the long axis of the humerus. Difficulty arises in maintenance of the reduction which can be by immobilization, closed percutaneous pinning or internal fixation.

Cubitus varus or bow elbow or gunstock deformity is the result of malunion occurring as a complication of supracondylar fracture of the humerus. It occurs in only the extension type of supracondylar fracture of the humerus, causing a reduction or loss of the carrying angle.

Decrease or increase in the carrying angle of the elbow generally follows a supracondylar or other elbow fracture in childhood. Although the normal child has great powers of spontaneous recovery following injury, there may nevertheless be some epiphyseal damage that fails to correct, where there is evidence of interference with the carrying angle the child should be observed for a number of years. If there is failure of spontaneous correction, or even deterioration, and the deformity is very unsightly, correction by osteotomy may a tardy ulnar nerve palsy.

Medial instability may occur in athletes who subject their elbows to severe valgus stresses by throwing there may be attenuation of the medial collateral ligaments, or even rupture. Mild case may subside with rest but in some a reconstruction may become necessary if there is the desire to continue with the activity. Instability is also seen in rheumatoid arthritis, the cubitus varus there is a decrease in the carrying angle [gunstock deformity] the commonest cause of unilateral alteration in the carrying angle is an old supracondylar fracture. Valgus and varus laxity and instability may also follow certain elbow fracture.

Various types of osteotomies have been described, each claiming improvements in the cosmesis as well as lesser complication rate with their technique.

The study was carried out to identify the most possible cause for the cubitus varus, to define the best method of recognizing the deformity and its prevention and to evaluate the indication for and result of surgical treatment of the established deformity.

### METHODS

The study was carried out the Department of Orthopaedics of Indira Gandhi institute of medical sciences, Patna. Total 10 cases were considered for final follow up and analysis. The assessment of cubitus varus deformity was done by using goniometer/protractor and it was graded as per the criteria. Table 1 for grading of Cubitus varus as.

#### Table 1: Grading of Cubitus varus.

Grade I	Physiological Cubitus valgus was lost.
Grade II	Cubitus Varus upto 5°
Grade III	Cubitus Varus of more than 5°

A method of accurately measuring the internal rotation of the shoulder in a position with the elbow at 90° flexion on the back and the shoulder held at the maximum extension.

When a patient with cubitus varus attempts to rotate his shoulder

**\*CORRESPONDING AUTHOR Dr.Shailesh kumar\***

Senior Resident, Deptt of orthopaedics IGIMS Patna

internally, there is an apparent increase in the degree of internal rotation at the shoulder of fracture side. The angle formed between the back (horizontal plane) and the forearm indicates the degree of internal rotation.

Radiological evaluation was done by Beals method by which carrying and Bowmens angle were measured. Indication for surgery – even when cubitus varus of Grade II is clearly apparent, both patients and family usually tolerate the condition and rarely request surgery.

In grade III cases with >100 of varus, one think the condition should be corrected, especially in girls. One do not postpone correction until the end of growth period but delaying operation until after one year from fracture and await full restoration of elbow extension. All the cases were operated with modified French osteotomy. Result were graded by the criteria as Excellent, Good and Poor after a follow up of 1 and half years.

**Table 2: Evaluation of final results.**

Evaluation of final results	
Excellent	Correction to within 5° of the Contralateral elbow.
	Maintenance of preoperative elbow motion.
	No perioperative complication.
Good	Demonstrated a valgus elbow position
	Motion to within 10° of the preoperative level.
Poor	Any perioperative complication including residual varus.
	Loss of greater than 10° of elbow motion.

**RESULTS**

In our study of 10 cases there were 30% male and 70% females which is a strong evidence for cosmetic concerned as parents are more conscious about the cosmesis of female children. In our series all the patients were within age group of 6 years to 13 years, which again indicates that cubitus varus deformity is commonest pediatric problem. The average age at operation was 9.7 years. In our series in 60% cases dominant upper limb i.e. right elbow was affected and in 40 % cases non dominant upper limb (left elbow) was affected. There was not a single case of bilateral cubitus varus in our series. The average correction of carrying angle was 5.7o of valgus. Table 3 showing carrying angle of both normal and varus side correction.

**Table 3: Angles of both normal and varus side correction.**

Preop varus (Degrees)	( )	Post op valgus (Degrees)	Difference from normal (in Degrees)
-14	(8)	+5	+3
-12	(12)	+10	+2
-8	(10)	+6	+4
-18	(11)	+6	+5
-12	(10)	+8	+2
-15	(12)	-5	-5
-20	(15)	+12	+3
-16	(8)	+5	+3
-14	(12)	+6	+6
-12	(10)	+4	+6

Carrying angle: - varus; + valgus; ( ) Normal

Only one patient had residual varus deformity of -5° due to inadequate wedge removal at surgery.

All the patients were having nearly the normal range of motion of the affected elbow. Table 4 shows the range of motion of varus side preoperatively and postoperatively at followup.

**Table 4: Range of motion (ROM) of varus side preoperatively and postoperatively or at follow up**

Range Of motion (ROM) (Degrees)	Follow up or Postoperatively (Degrees)
0-125	0-125
0-120	0-120
0-130	0-130

0-132	0-132
0-120	0-120
0-122	0-122
0-135	0-133
0-132	0-132
0-126	0-120
0-124	0-116

Only one patient suffered a radial nerve injury which in the form of Neurotmesis. This stresses importance of careful dissection to be done at the time of surgical correction of deformity. Every attempt should be made to protect this nerve in the proximal portion on the lateral approach. This was the same patient with residual deformity of -5°.

The nerve was repaired and partial recovery was evident. There was no infection, hypertrophic scar, nonunion. The final results were calculated according to the criteria of Oppenheim WL.

The study shows excellent results in 70%, Good in 20% and poor in 10% as per Table 5.

**Table 5: Results according to the criteria of Oppenheim WL, Clader et al.**

CA (Degrees)	ROM (Degrees)	Complications	Results
+5 (8)	0-125	--	Excellent
+10 (12)	0-120	--	Excellent
+6 (10)	0-130	--	Excellent
+6 (11)	0-132	--	Excellent
+8 (10)	0-120	--	Excellent
-5 (12)	0-122	Radial nerve injury and residual varus	Poor
+12 (15)	0-133	--	Excellent
+5 (8)	0-132	--	Excellent
+6 (12)	0-120	--	Good
+4 (10)	0-116	--	Good

( ) Normal: CA – carrying Angle; ROM – Range of Motion

**Case 1**



**Figure 1: Clinico-radiological photographs showing preoperative and post-operative conditions.**

**Case 2**



**Figure 2: Clinico-radiological photographs showing preoperative and post-operative conditions.**

## DISCUSSION

Cubitus varus deformity is one of the most common complications seen in paediatric patients. The cubitus varus can increase the risk of lateral condylar fracture, pain, tardy posterolateral rotatory instability, internal rotational malalignment and poor cosmesis, various corrective surgeries are described for the deformity. A lateral closing wedge through a posterior approach, used an intact periosteal hinge medially and two screws with a wire loop laterally to control the distal fragment. Applied a step cut technique of distal humerus valgus osteotomy using one cortical screw, cubitus varus deformity following malunited fracture of supracondylar humerus.

The lateral approach for supracondylar osteotomy is rather simple and more convenient for internal fixation rather than classical posterior approach. Preoperative planning is important in that the surgeon must consider the pitfalls ahead of time preserving the medial cortex is of paramount importance in obtaining stability with use of minimal internal fixation. Fixation is also complicated by the thin nature of distal humerus. Small degrees of rotational malalignment are clinically compensated by the shoulder and much of the rotational deficit may be more apparent than real such a deficit results from an oblique

axis of the elbow displaced by the fracture from its usual transverse plane. The significance of medial rotation is debatable the minor rotation can be compensated by shoulder movement and major and recent deformity may produce an attitude of medial rotation of the limb that makes the varus deformity look worse. Therefore correct any rotation which is to be in excess of 20°. In two patients, correction of internal rotation was done due to 35° of internal rotation measured.

The present study confirms that the deformities that follow supracondylar fracture are the result of malunion rather than the growth disturbance. There were no progressive deformities. Since the deformity is not progressive and does not remodel, and since healing is more rapid, fixation is easier at a younger age, it is suggested that the deformity should be corrected early, rather than at the conclusion of growth. The fracture is metaphyseal and does not involve the growth plate so lateral overgrowth or slowing down medially should not occur. No patient reported increase of deformity during growth and hence growth disturbance is unlikely to be cause of deformity. It was not observed the extension of the fracture line through the epiphysis so that stimulation of growth can occur.

Attention to the technical details is crucial to the success of the supracondylar osteotomy for correction of cubitus varus. The stability of osteotomy is enhanced by immobilizing the elbow in extension with forearm supinated. Piggot and McCoy supports the postoperative immobilization of arm in extension although they prefer to use postoperative traction. In present study no malalignment were seen after immobilization in extension and full supination of forearm after osteotomy. Cubitus varus was found to be the secondary to the medial tilting of the distal fragment. Failure to recognize this initial or subsequent medial tilt during early treatment of the fracture was the major factor in the development of cubitus varus deformity. The cosmesis was the primary indication for the corrective surgery. Most of the operations aims at the correction of only the varus deformity and the rotational problems are left untreated.

About 30% Failure has been recorded. This is because the lateral tilt of the distal fragment can be increased by rotational deformity and the lateral condyle become too prominent causing an ugly appearance. Dowd and Hopcroft reported 85% varus deformity due to medial rotation or tilt of the distal fragment. Hindman et al described that the rotation of the distal fracture fragment in the supracondylar fracture is the contributing factor in the deformity. Khare et al described the full pronation of forearm prevents cubitus varus deformity. stated that the supinated position of the forearm should be avoided in the treatment of the elbow in the children. Therefore careful clinical and x ray evaluation using these method could have detected and prevented most, if not all of the cubitus varus deformity.

Lateral closed wedge osteotomy is good method to correct the deformity. Appropriate stabilization preferably with plate and screw will minimize the complication. Surgeon should be aware of complication and should counsel the same.

## CONCLUSION

Cubitus varus is the most common complication of supracondylar fracture of the humerus it is nearly always secondary to uncorrected or recurrent medial tilting of the distal fragment of the fracture. It is a preventable complication if medial tilt is recognized early by careful clinical and radiological assessment. It is primarily a cosmetic deformity as elbow had a full range of motion with no functional deformity.

The result obtained in our study concluded that closed dome osteotomy is safe and effective treatment for the correction of cubitus varus deformity with few minor complications. Modified French method proved safe and satisfactory as it has improved anatomy and cosmetic results. Loss of correction of cubitus varus deformity does not occur. Cubitus varus deformities require surgical correction or may lead to various consequences like secondary fractures, lateral instability and nerve palsy.

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