



## A PROFILE OF PATIENTS WITH CUBITUS VARUS DEFORMITY IN FOLLOW-UP CASES OF SUPRACONDYLAR FRACTURES

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### ABSTRACT

**Background/Aim:** Cubitus varus is a frequent deformity following healing of supracondylar fractures, particularly in children. However, there are limited studies describing its epidemiology. **Methodology:** This study was carried out over a period of one year at a tertiary care facility in Central India and included a total of 19 patients who developed cubitus varus following supracondylar fracture healing during the follow-up. Demographic data such as age, sex, place of residence, side of involvement and time since supracondylar fracture were noted. Carrying angle of normal side and affected side was noted. Mean lateral condylar prominence index (LCPI) was calculated. Data has been presented as number and percentages and mean  $\pm$  standard deviation. **Results:** All had unilateral involvement. Mean age of patients was  $9.95 \pm 4.43$  years. Majority were aged 5-9 years and were males from rural areas (63.2%). Left side (68.4%) was more commonly involved than the right side (31.6%). Mean time since primary injury was  $16.63 \pm 4.39$  months. Mean carrying angle of normal and affected side were  $10.32 \pm 1.67$  and  $-18.05 \pm 2.97^\circ$  respectively. Mean LCPI was  $-0.11 \pm 4.55$ . **Conclusion:** Cubitus varus is a common deformity seen in healing supracondylar fractures in children. The deformity is generally reported within one-year of primary fracture. Corrective and preventive strategies should be adopted to provide relief to the affected patients.

**KEYWORDS :** Cubitus varus, Gunstock deformity, children, supracondylar fracture, lateral condylar prominence index (LCPI).

### INTRODUCTION

Cubitus varus or "gunstock" deformity is a common long-term complication of a supracondylar fracture of the humerus<sup>1</sup>. Majority of patients, particularly children, being managed conservatively for supracondylar fractures experience it<sup>2,4</sup>. It often occurs as a late complication of the supracondylar fractures in skeletally immature children<sup>5</sup>. Cubitus varus is a triplanar malalignment of the elbow in which varus angulation takes place in coronal plane and extends to the sagittal plane with an internal rotation in the transverse plane<sup>6</sup>. The condition may also complicate with co-existing nerve damage or vascular insufficiency<sup>7</sup>. Owing to this deformity the range of elbow motion is restricted<sup>8</sup>. However, the deformity is often ignored owing to no substantial functional impairment and consideration of the deformity as a cosmetic defect only.

Despite being a common occurrence among children with supracondylar fractures, there is limited literature regarding its epidemiology, especially from India. In the present study we made an attempt to describe the epidemiology of cubitus varus deformity among patients visiting orthopaedic follow-up clinic of a tertiary care centre in Central India.

### MATERIAL AND METHOD

This descriptive study was carried out over a period of one year at a tertiary care facility in Central India. Records of all the consecutive patients attending the Fracture follow-up clinic of the Department of Orthopedics presenting with Cubitus varus deformity following supracondylar fracture were evaluated for demographic and epidemiological data. Patients with cubitus varus deformity due to any other cause than supracondylar fractures were excluded from the study.

Anteroposterior (elbow in full extension and forearm in full supination) and lateral radiographs of both the elbows were taken. The humerus-elbow-wrist angle was measured on both the sides in all patients and the angle of correction was estimated.

The lateral condyle prominence index (LCPI) was assessed by measuring the standard antero-posterior radiograph of the deformed and the normal elbow in full extension. Lateral Prominence Index (LCPI) is the difference between the measured medial and lateral width of the bone from the longitudinal mid-humeral axis and is expressed as a ratio of

total width of distal humerus to minimize errors from magnification and variation of size of individual humeri. Formula for LCPI =  $\frac{AB-BC}{AC} \times 100$  (A-medial epicondyle, B-mid humeral line, C-lateral epicondyle, minus (-) indicates varus).

Range of motion of the affected elbow was noted

Data so collected was fed into computer using Microsoft Excel software. Data has been represented as frequency (number) and proportions (percentages) or mean  $\pm$  standard deviation. As the study was only descriptive in nature and did not involve any hypothesis testing, hence to statistical hypothesis testing tools were employed.

### RESULTS

A total of 19 cases of cubitus varus as a complication of supracondylar fracture healing were seen during the study period. All the cases had unilateral involvement. Age of these patients ranged from 5 to 23 years. Except for 1 patient, all the others were aged  $\leq 15$  years. Majority of patients were aged 5-9 years (63.2%). Mean age of patients was  $9.95 \pm 4.43$  years. Majority of patients were males (63.2%) and were from rural areas (63.2%). Left side was more commonly involved (68.4%) than the right side (31.6%). Carrying angle of normal side ranged from  $8$  to  $14^\circ$  with a mean of  $10.32 \pm 1.67^\circ$ . Carrying angle of affected side ranged from  $-24$  to  $-14^\circ$  with a mean of  $-18.05 \pm 2.97^\circ$ . Lateral condylar prominence index (LCPI) ranged from  $-8.2$  to  $5.8\%$  with a mean of  $-0.11 \pm 4.55\%$ . Time since fracture and presentation ranged from 11 to 26 months with a mean of  $16.63 \pm 4.39$  months (Table 1).

**Table 1: General Profile and Clinical Characteristics of Patients presenting with Cubitus varus deformity (n=19)**

SN	Characteristic	Number of cases	Percentage
1.	Age		
	5-9 Years	12	63.2
	10-15 Years	6	31.6
	> 15 Years	1	5.3
	Mean age $\pm$ SD (Range) in years	$9.95 \pm 4.43$ (5-23)	
2.	Sex		
	Male	12	63.2
	Female	7	36.8
3.	Place of residence		
	Rural	12	63.2

	Urban	7	36.8
4.	Side of involvement		
	Left	13	68.4
	Right	6	31.6
5.	Mean Carrying angle $\pm$ SD (range)o		
	Normal side	10.32 $\pm$ 1.67 (8 to 14)	
	Affected side	-18.05 $\pm$ 2.97 (-24 to -14)	
6.	Mean lateral condylar prominence index $\pm$ SD (Range) %	-0.11 $\pm$ 4.55 (-8.2 to 5.8)	
7.	Mean follow-up period since supracondylar fracture $\pm$ SD (Range) in months	16.63 $\pm$ 4.39 (11-26)	

## DISCUSSION

Cubitus varus is the most common delayed complication after supracondylar fracture of humerus during childhood. Although it is sometimes reported in young and mature adults too yet the condition basically develops in childhood and cases in young and mature adults are the untreated cases of cubitus varus developed in childhood<sup>9,10</sup>. In the present study, however, except for one patient aged 23 years, all the other patients were children, predominantly those aged 5-9 years, males and from rural areas (63.2%). The age and sex profile of the patients in the present study is comparable to that reported in a recent study by Verka et al.<sup>5</sup> who had 84% patients in age range 5-10 years and more than two-third (68%) males. Srivastava et al.<sup>11</sup> in their study reported the age range of children as 6.6 to 14 years (mean age 8.5 years) and proportion of males as 57.1%. The high proportion of males as compared to females might be owing to a higher risk of supracondylar fracture among boys as compared to that in girls. A dominance of rural children as compared to urban in the present study might be linked with a higher reliance on conservative management in low-resource rural settings.

In the present study, all the cases had unilateral involvement. Bilateral cubitus varus is not a common occurrence and is not reported in literature elsewhere too. In the present study left side (68.4%) was more commonly involved than the right side (31.6%). Though, Verka et al.<sup>5</sup> also reported right side to be less commonly involved (44%) as compared to left side (56%) yet no side disposition has been reported in other studies<sup>5,6,11,12</sup>.

In the present study, the time gap between primary injury (supracondylar fracture) and reporting of deformity ranged from 11 to 26 years with a mean of 16.63 $\pm$ 4.39 months. Compared to the present study, Srivastava et al.<sup>11</sup> in their study reported a mean gap of 2.5 years (30 months) between primary injury and corrective surgery. A shorter gap in the present study could be attributed to the fact that the present study included patients who first time reported of this deformity to our facility. The longer gap in their study might be attributed to time gap between hospital reporting and time taken for decisionmaking for surgical intervention.

In the present study, carrying angle of normal side ranged from 8 to 14° with a mean of 10.32 $\pm$ 1.67°. Carrying angle of affected side ranged from -24 to -14° with a mean of -18.05 $\pm$ 2.97°. Compared to the present study, Verka et al.<sup>5</sup> in their study reported the carrying angle of affected side in <-20° to 0° range with majority having carrying angle in -11 to -20° range. In the present study Lateral condylar prominence index (LCPI) ranged from -8.2 to 5.8% with a mean of -0.11 $\pm$ 4.55%. Compared to the present study, Verka et al.<sup>5</sup> in their study reported LCPI in range -7.60% to +10.64% with a mean of +1.18%.

The findings of the present study thus show that cubitus varus is an underrecognized complication of supracondylar fracture healing and requires osteotomy for correction. Often ignored

owing to no substantial impact on functional dimension the cosmetic part may have a substantial effect on the quality of life, particularly on attainment of adulthood. Rare yet possible complication of ulnar neuropathy should also be considered while considering it only as a cosmesis problem.

## CONCLUSION

Cubitus varus is a common deformity seen in healing supracondylar fractures in children. The deformity is generally reported within one-year of primary fracture. Corrective and preventive strategies should be adopted to provide relief to the affected patients.

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