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**RCS Khandelwal**  
Department of Orthopaedics,  
Seth G. S. Medical College and  
KEM Hospital, Mumbai,  
Maharashtra, India

**Pratik Kotangale**  
Department of Orthopaedics,  
Seth G. S. Medical College and  
KEM Hospital, Mumbai,  
Maharashtra, India

**Shiva Chahal**  
Department of Orthopaedics,  
Seth G. S. Medical College and  
KEM Hospital, Mumbai,  
Maharashtra, India

**Neeraj Kalra**  
Department of Orthopaedics,  
Seth G. S. Medical College and  
KEM Hospital, Mumbai,  
Maharashtra, India

**Corresponding Author:**  
**Pratik Kotangale**  
Department of Orthopaedics,  
Seth G. S. Medical College and  
KEM Hospital, Mumbai,  
Maharashtra, India

## Outcome of corrective osteotomy in case of Genu valgum stabilised by K-wire fixation under 18 years of age

RCS Khandelwal, Pratik Kotangale, Shiva Chahal and Neeraj Kalra

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### Abstract

**Background:** Objective was to study functional outcome of k-wire fixation in Genu valgum patients under 18 years age.

**Methods:** Medial wedge osteotomy was done in all Genu valgum patients with significant deformity and was fixed with medial k-wires followed by postoperative cast. Patients were assessed by preoperative and postoperative LDFA and TFA for correction and postoperative Bostman Score was assessed for functional outcome.

**Results:** 27 Genu valgum patients (19 females and 8 males) were assessed in this study. There was significant correction in the mean radiological tibio-femoral angle and lateral distal femoral angle from 17.940 to 8.040 and 88.950 to 78.750, respectively. At 3 month postoperatively Bostman score 88.9% had more than good score while after 6 month all patients had more that good score.

**Conclusion:** This osteotomy with k-wire fixation is less morbid, with minimal implants, safe and effective procedure with good correction in radiological parameters and better functional outcome with minimal complications.

**Keywords:** Genu valgum, K-wire fixation, Bostman Score

### Introduction

Genu valgum or "knocking knees" are part of the lower extremity coronal plane deformity. Most patients have no symptoms and no functional limitations. Most patients attend the clinic between the ages of 5 and 12 when parents often worry about appearing to be on their knees.

It is important to find out if the defect is mainly from the femur or tibia. If untreated, altered biomechanics of the knee cause problems like anterior knee pain, patellofemoral instabilities and gait abnormalities, and early osteoarthritis. A large numbers of corrective osteotomies have been described for knock-knee (GV) arising from distal femur-like lateral opening wedge, medial closing wedge, dome osteotomy, wedgeless spike, and "V" osteotomy, with few advantages of 1 over the opposite. Still there is dilemma regarding the most accepted osteotomy for Genu valgum. In this prospective study we had done medial close wedge osteotomy and fixed with k-wires in 27 limbs. We found this procedure is safe, effective, less morbid, short learning curve and minimum complications. There was no need for repeat surgery for implant removal.

Women with fracture following a road traffic accident and with tumor, primary hyperparathyroidism or secondary causes of osteoporosis (i.e. renal insufficiency, corticosteroid use) were excluded. Participants on treatment with calcium and vitamin D, anti-osteoporotic or other medications potentially influencing the bone metabolism were also excluded from the study.

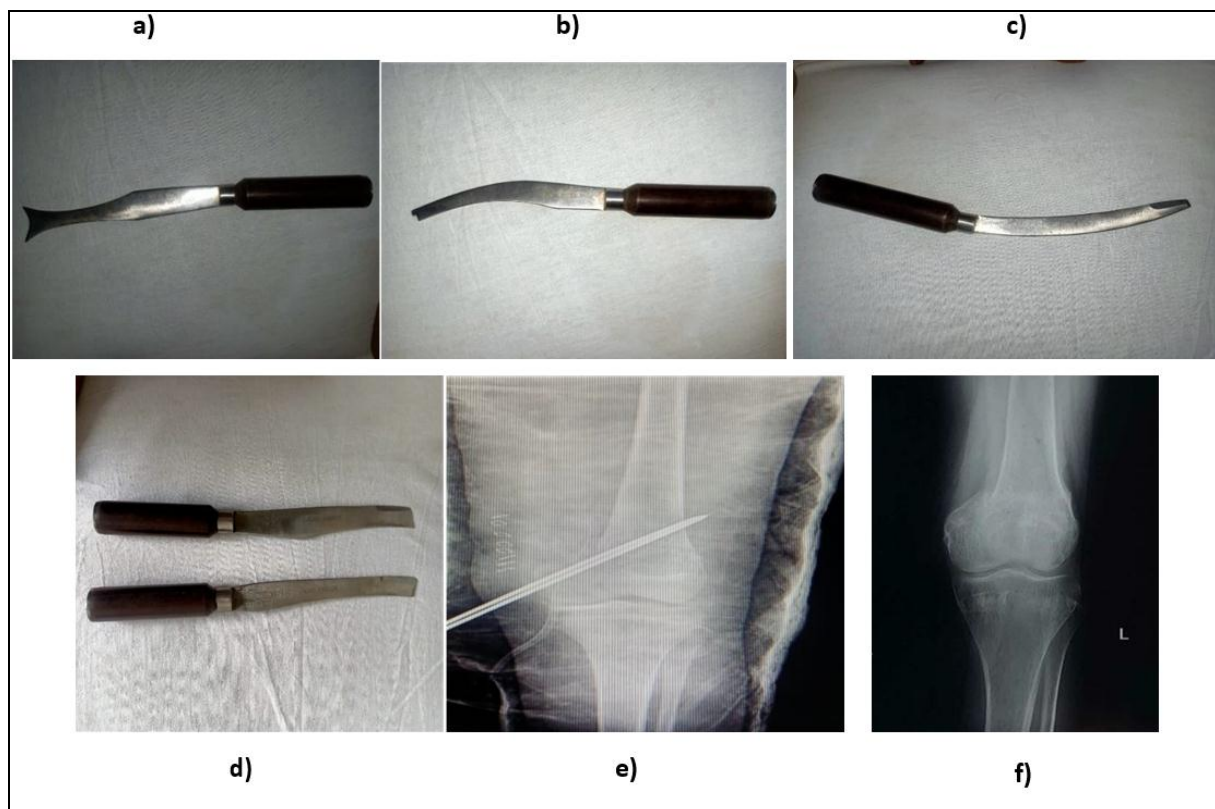


**Fig 1:** Preoperative clinical photo

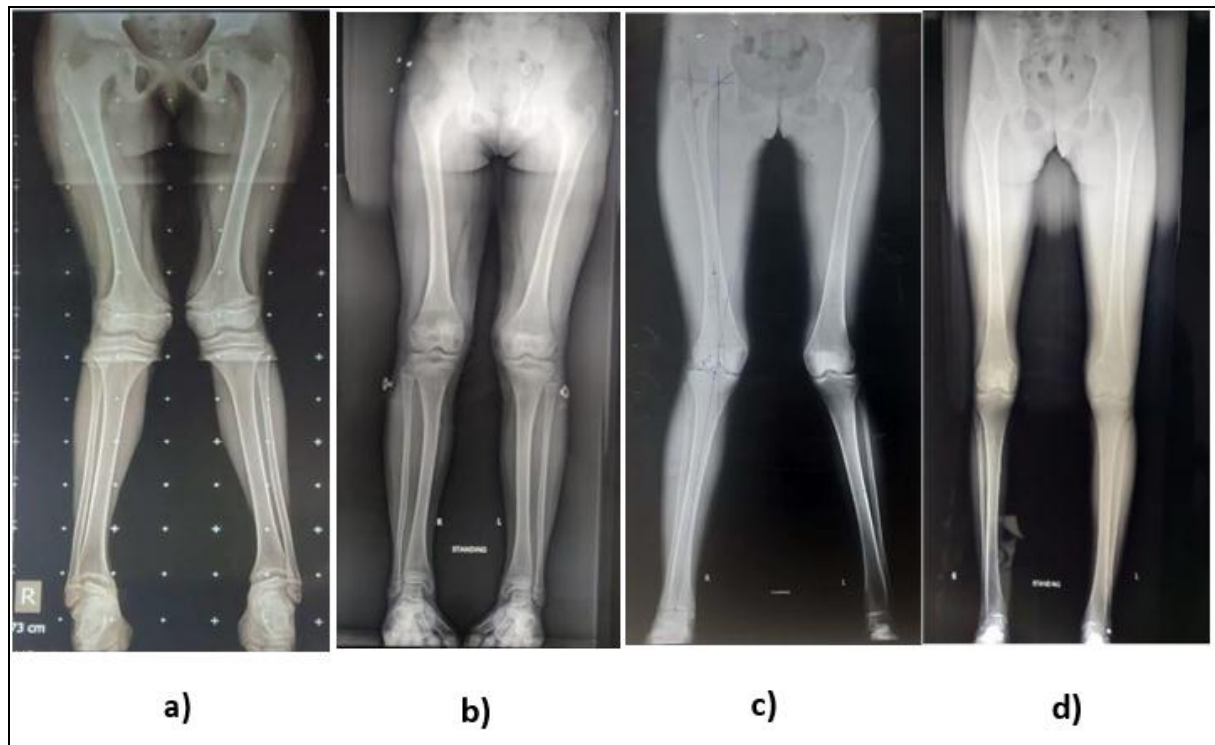
### Materials and Methods

We carried out prospective study in Orthopaedics department of tertiary care hospital in between July 2019 to December 2021. The inclusion criteria were (1) Male and female of Indian origin aged between 8-18 years (2) Willing for regular follow up (3) Unilateral or bilateral involvement (LDFA = < 88 degree) (4) Origin of deformity primarily in distal femur (5) Patients operated in tertiary care centre in last one year. Patients who had Age <8 year and >18 year, patient not willing for regular follow up, origin of deformity in proximal tibia, patient having femoral condyle dysplasia, no metabolic abnormality. Patients were assessed in out-patient department for lower limb scannogram, calculation of LDFA and TFA and Bostman score included in the study after informed consent. The knee flexion test is done to rule out Genu valgum involving proximal tibia. The preoperative aTFA (anatomical tibio-femoral angle) and LDFA (lateral distal femoral angle) is calculated in scannogram. LDFA is calculated by angle form between line drawing through mechanical axis of femur and line parallel to joint orientation line while aTFA is calculated by angle between anatomical axis of femur and tibia.

The outcome was evaluated regarding corrective changes in aTFA and LDFA postoperatively. Also for functional outcome postoperative Bostman Score (Table 1) is calculated.



**Fig 2:** a) medial wall cutter b) anterior wall cutter c) posterior wall cutter d) lateral wall cutter



**Fig 3:** a) & c) Preoperative radiographs, b) & d) Postoperative radiographs



**Fig 4:** Postoperative clinical photo

### Operative Procedure

The procedure is performed in a low-lying area and under high control of the groin tourniquet. Great care was taken while it was suggested that the ankle should be free and the ASIS should be marked using electrocardiography cause to detect alignment during adjustment. The knee flexes and a "figure 4" is made. A moderate skin cut 4-5 cm long is made

1 cm long to 5-7 cm near the adductor tubercle inside the line of the femoral shaft. The deep fascia is identified and cut along with the cut. The area of the osteotomy has been identified about 0.5 to 1 cm near the vessels. Osteotomy site is secured under a C-arm with a 24G needle. The middle wall is osteotomized with an osteotome of the middle wall, an osteotomy of the front and back wall performed with a special osteotome to cut the front and back wall. The osteotomy is confirmed under the C-arm and a gentle varus force is used to correct the deformity. Intraoperative alignment is confirmed by a cautery point from the middle of the hip to the center of the ankle so that the cautery wire extends to the medial point under the C-arm. After repair the osteotomy area is repaired with two k cords from the middle side. Tourniquet is removed, hemostasis is reached and the wound is closed layer by improper absorption in the area. Cylindrical cast is extended from the groin to 4 cm higher from the medial malleolus (ankle joint).

Postoperative protocol: Drain was removed after 48-72 hours through creating window in cylindrical cast over the incision site, cast is reinforced after drain removal. Patients were discharged after suture removal on 14th postoperative day. Patients were advised to come for follow up after 4- 6 weeks for k-wire removal after confirming union at osteotomy site. Cast was continued till union accomplished. Cast was removed after union is achieved and mobilization is started. After 2 months, bilateral lower limb scannogram was done. Radiological TFA and LDFA is calculated, clinical Bostman score was also calculated. After 6 months final Bostman score was calculated.

### Statistical Analysis

Data was entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical

Variables were determined. Association between Variables was analyzed by using McNemar Test for paired categorical Variables. Paired t test was used to compare mean of quantitative variables. Bar charts and Pie charts were used for visual representation of the analyzed data. Level of significance was set at 0.05.

**Results**

Majority of the study population were females (70.4%) and males constituted only 29.6% of the study population. Majority of the patients belonged to the age group of 11-15 years (77.8%), followed by 6-10 years (11.1%) and >15 years (11.1%) demonstrating that common age of presenting to tertiary care center was 11-15 years. Mean age was 12.96.

**Table 1:** Distribution of Study Subjects according to the Age (N=27)

Age (Years)	No.	Perce nt
6-10	3	11.1
11-15	21	77.8
>15	3	11.1
Mean (SD)		12.96 (1.99)
Range		8-17

**Table 2:** Distribution of Study Subjects according to the Gender (N=27)

Gender	No.	Percent
Female	19	70.4
Male	8	29.6

Mean pre-operatively LDFA is 78.74 which is increased and corrected to mean post-operative is 88.95 which is statistically significant. Mean pre-operatively TFA is 17.49 which is corrected and reduced to 8.04, which is statistically significant. Mean difference is 9.44. At the end of 6th month 16 patients had excellent score and 11 patients had good score. Postoperative Bostman score is statistically significant.

**Table 3:** Comparison of LDFA between Pre-operative and Post-operative (N=27)

LDFA	Mean (SD)	P Value
Pre-operative	78.74 (2.14)	-
Post-operative	88.95 (1.57)	<0.001*

Mean Difference = -10.21 (2.37)  
95% Confidence Interval of Difference = -11.15 to -9.27 Paired t Test, P Value \* Significant

**Table 4:** Comparison of TFA between Pre-operative and Post-operative (N=27)

TFA	Mean (SD)	P Value
Pre-operative	17.49 (2.06)	-
Post-operative	8.04 (9.71)	<0.001*

**Table 5:** Comparison of Bostman Score at Follow up (N=27)

Bostman Score	3 Months n (%)	6 Months n (%)
Unsatisfactory	3 (11.1)	
Excellent	5 (18.5)	16 (59.3)
Good	19 (70.4)	11 (40.7)

McNemar Test, P Value = 0.004, Significant

In this study we studied about deformity correction in Genu valgum patients with k-wires fixation followed by cylindrical cast. In this study we have included patients with age between 8-18 years. Mean age difference was 12.96. Most patients presented to us with 11-15 years of age (77.8%). While before 11 years of age and after 15 years we had only 11.1% of

cases. Most common year of presentation was 11-15 years in this study. This study showed no significance of age in outcome. Twenty seven patients were included in this study out of which 19 were females (70.4%) and 8 were males (29.6%). Out of 27 patients with deformity 14 patients (51.9%) had right side deformity and 13 patients (48.1%) had left side deformity.

Mean duration of radiological union of osteotomy site was 3 months. 3 osteotomies had union in between 1-3 months while 24 had union at 3 months. Radiological union was seen after 3 months, we have used radiological evidence callus as the criteria of union. In our study we had unstable fixation with only medial k-wires intraoperatively, so we used one lateral k-wire to give additional stability.

Mean pre-operative LDFA was 78.74 degree which improved significantly after treatment to mean post-operative LDFA 88.95 degree (p-value <0.001) and mean preoperatively TFA 17.49 degree which improved significantly to postoperatively TFA to 8.04 degree (p value <0.001).

All 27 patients included in the study showed therapeutic improvement in terms of Bostman score which showed good functional outcome in 19 patients, 5 patients had excellent outcome while only 3 had unsatisfactory outcome at the end of 3 months. At the end of 6 months 59.3% patients had excellent score and 40.7% had good score. Overall the functional outcome of postoperative patients assessed by Bostman score was improved significantly from 3 to 6 months.

**Complications**

There were one wound complications occurred in our study, patient develop dermatitis after cast removal. We followed up at 1 month and 3 month to look for infection, pin loosening and cast complications.

**Conclusion**

Our study concludes that Genu valgum patients can be managed with medial closed wedge osteotomy fixed with 2-3 medial k-wires followed by cylindrical cast till radiological union achieved. It is a safe, simple, minimal implants and low cost procedure to correct valgum deformity. Minimal wound complications and avoidance of 2nd surgery. K-wire removal is also safe and easy and not require another surgery. This procedure gives good result clinically and radiologically.

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