

Original Research Article

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Functional and radiological outcome of wedgeless 'V' osteotomy for genu valgum in adolescents: a prospective cohort study

Simran Preet Singh, Pallav Gupta*, Aamir Choudhary

Department of Orthopaedics, Government Medical College, Jammu, Jammu and Kashmir, India

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***Correspondence:**

Dr. Pallav Gupta,

E-mail: dr.pallavgupta9@gmail.com

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ABSTRACT

Background: Genu valgum, commonly called "knock-knee", is a coronal plane angular deformity of knee, which is a common disorder affecting children and adolescents. Distal femoral wedgeless V osteotomy is one of the various methods of treating genu valgum.

Methods: A prospective cohort study was conducted between July 2017 to March 2020 in Govt Medical College, Jammu on 28 patients of genu valgum with femoral deformity. A wedgeless V osteotomy was done at the supracondylar level and fixed with K wires. The results were compared on the basis of radiological parameters such as TFA and MAD. IMD was also compared. The functional outcome was evaluated using Bostman knee score at 6 months of follow-up. 1 patient was lost in follow up and was not included in the study.

Results: 27 patients were included in the study with a mean age of 17.5 years (range 15-21 years). The radiological parameters such as TFA showed improvement from a mean of 20.71 to 5.87 postoperatively. IMD decreased from a mean of 13.77 cm to 3.69 cm and MAD from 18.76 mm to 3.03 mm. The functional assessment was made using Bostman score with a mean of 27.1 at final follow up.

Conclusions: Supracondylar wedgeless V-osteotomy is an excellent technique for correction of the genu valgum deformity in the adolescent. The learning curve, surgical exposure, and surgical time being minimal. Sparse complications have been reported with this technique as compared to the other type of osteotomies.

Keywords: Supra condylar 'V' wedgeless, Osteotomy, Genu valgum

INTRODUCTION

Genu valgum, commonly called "knock-knee", is a condition in which the knee bends in and touch each other. It is a coronal plane angular deformity of knee commonly affecting children and adolescents. Altered biomechanics of the knee, due to angular deformities leads to distorted stress distribution on the weight-bearing surface of the knee joint.¹

Genu valgum is commonly idiopathic, while nutritional rickets is another leading cause of these deformities in

developing countries. The deformity usually originates from the distal femur, proximal tibia, or knee joint.^{2,3} The vast majority of cases are physiologic variants, which resolve normally with age, by gradual reduction of valgus to normal level of 5 to 7 degrees.⁴

Various types of corrective osteotomies of the distal femur have been described in the literature i.e., lateral open wedge, medial close wedge, dome osteotomy, spike osteotomy, distraction osteosynthesis using monolateral and ring external fixators and wedge-less 'V' osteotomy.⁵⁻⁹ Aglietti et al (1987) originally described it for genu valgum

deformity secondary to lateral compartment osteoarthritis in adults.⁶

An osteotomy to correct valgus deformity can be performed either at the lower end of the femur or at the upper end of the tibia depending on site of deformity. Valgus deformity of the knee is usually in the distal femur and a corrective procedure would usually be a varus close wedge osteotomy.¹⁰⁻¹² However, a closing wedge osteotomy leads to limb shortening and requires greater circumferential bone exposure to remove a wedge.

Distal femoral wedge-less ‘V’ osteotomy is a safe, effective and easy to perform surgery with a short learning curve.¹³

Our study aims to highlight the outcomes of a distal femoral wedgeless V osteotomy based on radiological parameters such as TAD, IMD and MAD. The functional outcome being assessed using Bostman Knee score at final follow-up at 6 months.

METHODS

A prospective cohort study was conducted in our institute between July 2017 to March 2020 after seeking approval from IEC. The patients were followed up for a period of 6 months post-surgery.

Source and method of collection of data

A prospective cohort study was done in Govt Medical College, Jammu between July 2017 to March 2020 on 27 patients belonging to the age group of 15-21 years who had genu valgum with distal femur deformity. A detailed history and clinical examination were done. Proper radiographs were taken for evaluation. The study was conducted after taking written informed consent from each patient.

Inclusion criteria

Patients in age group 15-21 years. Patients with Intermalleolar distance >10 cm. Patients with Tibiofemoral angle >15 degrees.

Exclusion criteria

Patients with generalized ligamentous laxity. Patients with Rickets or other metabolic abnormalities. Patients with fixed flexion deformity. Patients with genu recurvatum. Patients with associated ipsilateral hip or ankle deformity.

Pre-operative assessment was done using radiological parameters such as TFA and MAD. Intermalleolar distance was also calculated. Functional assessment of patients was done post operatively with Bostman Knee Scoring at 6 months of final follow-up. TFA, MAD and IMD was also calculated postoperatively. (Figure 1a)

The normality of the data was examined using appropriate tests and the scores were compared between pre- and post-operative time points using tests (unpaired t test and Fisher exact test). All statistical analysis were considered significant at $p<0.05$ level of significance. Software used for statistical analysis was EpiInfo Version 3.0 and SPSS.

Surgical technique

All cases were performed under regional anaesthesia (Spinal) with the patient in supine position. Intravenous antibiotic prophylaxis was given. A longitudinal incision of 5-8 cm was made over medial aspect of distal thigh.

After identifying the adductor tubercle a V shaped incomplete osteotomy is done using a oscillating saw. The lateral cortex was left intact. The deformity is then corrected by a gentle varus force with knee in extension. Intra op alignment was then checked. The osteotomy was fixed with two 2.0 mm K wires. (Figure 1b)

Postoperative rehabilitation

Standard rehabilitation protocol was followed post-surgery. The patient was put on a long knee back slab with strict non weight bearing. The K wires were removed at 10 week postoperatively. After this the patient was mobilised with a walker with toe touch and gentle physiotherapy was started. After the union of osteotomy site was assessed using radiographs, gradual full weight bearing was done as tolerated by the patients. (Figure 1c)

RESULTS

Total number of patients at the beginning of our study was 28, 1 patient was lost to follow up and was not included in the study.



Figure 1: (A) Pre-operative x ray showing genu valgum deformity. (B) Post-operative x ray osteotomy fixed with K wires. (C) Follow up Xray taken at 6 weeks.

Patients ranged from 15-21 years ($\mu=17.5\pm2.5$ years). Majority of the patients in the study were males (75%) and

the rest were females (25%). Cosmetic deformity (50%) was the most consistent chief complaint followed by pain (30%) and gait abnormalities (20%).

Improvement in radiological TFA was recorded from 20.71 ± 2.63 degrees before surgery to 5.61 ± 0.80 degrees postoperatively. Another parameter MAD was also assessed which came out to be 18.76 ± 4.9 mm preoperatively to 3.03 ± 0.67 mm postoperatively.

While comparing the intermalleolar distance, the average IMD preoperatively was found out to be 13.77 ± 1.75 cm before the procedure was performed to 3.69 ± 0.66 postoperatively.

The final functional outcome was assessed based on the Bostman knee score, which came out to be a mean of 27 ± 3.71 at final follow up at 6 months. About 21 patients

(77.77%) had excellent outcome, 6 patients (22.22%) had good functional outcome and none had poor outcome.

No serious complications were noted in any of the patient included in the study. 1 of the patients had a superficial infection which was addressed by removing of 2 sutures and proper antibiotic cover was given, which was followed by secondary closure.

Table 1: Significance of various parameters.

Parameter	Preoperative	Postoperative	P value
TFA (Radiological)	20.71 ± 2.63	5.61 ± 0.80	<0.05
IMD (in cm's)	13.77 ± 1.75	3.69 ± 0.66	<0.05
MAD (in mm)	18.76 ± 4.9	3.03 ± 0.67	<0.05

Table 2: Comparison of various studies.

Parameter	Our Study	Gupta et al ¹³	Ranjan et al ¹⁵	Agarwal et al ¹⁶	Agleitti et al ⁵
Age (in years)	17.5 average (15-21)	16.9 average (15-21)	11 average (13-21)	13-21	15-77
Sex	Males -75% Females-25%	Males-16.7% Females- 83.33%	Males-60.16% Females-40.86%		
TFA radiological (in degrees)	Preop- 20.71 ± 2.63 Postop- 5.61 ± 0.80	Preop- 22.2 ± 2.9 Postop- 5.1 ± 2.1	Preop- 25.6 ± 2.3 Postop- 6.1 ± 0.8	Preop- 20.2 Postop- 3.05	Preop- 15-28 Postop- 0-5
IMD (in cm)	Preop- 13.77 ± 1.75 Postop- 3.69 ± 0.66	Preop-13.83 Postop- 1.5	Preop- 17.3 ± 2.3 Postop- 3.9 ± 0.7		
MAD (in mm)	Preop- 18.76 ± 4.90 Postop- 3.03 ± 0.67	Preop- 19.56 ± 6.625 Postop- 3.7 ± 3.875			
Bostman knee score	27.1 ± 3.71 Excellent-77.77% Good-22.22%	Excellent- 95.65% Good-4.35%	Excellent-9.95% Good-0.05%	Excellent-66.71% Good-33.33%	

DISCUSSION

Our study was done in Government Medical college Jammu. A total of 28 patients were included at the beginning of the study, 1 patient were lost to follow up and finally 27 patients completed the study.

The age group of patients included in study was 15-21 years with a mean age of 17.5 years. Gupta et al 13, in his study had patients ranging from 15-21 years with a mean age of 16.9 years. Mean age was 15.8 years in a study by Ranjan et al.¹⁵ In our study males outnumbered females in a ratio of 3:1. In Gupta et al. study the patients were predominantly females (80.33%). In our study cosmetic

deformity (50%) was the most common complaint which led to surgical intervention followed by pain and gait abnormalities.

The radiological TFA was 20.71 degrees preoperatively which improved to 5.61 degrees after the surgery. Aglietti et al in his study found out the TFA in the range of 15-28 degrees improved to 0-5 degrees postoperatively. Agarwal et al in his study showed TFA improved from 20.2 degrees to 3.05 degrees after surgery.¹⁶ The IMD in our study improved from 13.77 ± 1.75 cm to 3.69 ± 0.66 cm post-surgery. Gupta et al in his study showed improvement in mean IMD from 13.83 to 1.5 cm post intervention. Ranjan et al concluded that IMD enhanced from 17.3 cm to 3.9 cm after surgery.

The mean MAD was 18.76 ± 4.90 mm preoperatively which improved to 3.03 ± 0.67 mm postoperatively. Gupta et al also concluded on the same lines, with an improvement of 19.56 ± 6.6 mm to 3.7 ± 3.8 mm after osteotomy.

The functional outcome assessed by Bostman knee score, was found out to be 27.1 ± 3.71 at the end of follow up. 77.77% patients had excellent outcome and 22.22% patients had good functional outcome. Agarwal et al in his study showed 88.89% of the patients had excellent outcome and 11.11 had good. 99.95% of the patients had an excellent outcome in a study by Ranjan et al.

Complication of superficial site infection was seen in 1 of the patients which resolved after wound wash and antibiotics. Agleitti et al in his study reported no complications whereas Gupta et al in his study had 2 cases of deep wound infection which requires implant removal.⁵ The period of follow up in our study was 6 months as compared to 19.8 months in study by Gupta et al.¹³

Limitations

Sample size taken for study was small and a future study with a larger sample size is desired. Most of the patients in the study were males so groups were not comparable on basis of gender.

CONCLUSION

The technique is associated with minimal complications, compared to the other type of osteotomies. The learning curve, surgical exposure and surgical time is also insignificant. The shape of the osteotomy allows correction while preserving sufficient stability. However, in the original description, the internal fixation wasn't performed; instead cast immobilization was considered for a longer period. We prefer internal fixation with K-wires that has advantages in terms of monetary value and no requirement of repeat surgery for removal, making it worth adopting in a low-income patient.

Therefore, supracondylar wedgeless V osteotomy is an excellent technique for the correction of genu valgum in adolescents.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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