



Reporting Outcome and Evaluating the Efficacy of Biplanar Lateral Distal Femoral Osteotomy: Two Years Follow up Study

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Authors' contributions

This work was carried out in collaboration among all authors. Authors AY, BO, MM, APS, MM and SH gave substantial contribution to the conception, design, drafting the work analysis and interpretation of data for the work and had in article preparing for drafting or revising it critically for important intellectual content. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Genu valgum could be approached by uniplanar or biplanar osteotomy in which site union and postoperative knee range of motion play important roles in technique selection.

Methods: Study was performed on 30 cases including 14 males and 16 females. Two of them had severe genu varum deformity and 28 had genu valgum. Participants underwent biplanar lateral distal femoral osteotomy. Osteotomy requirement was assessed by Lateral distal femoral angle measurement.

Results: Thirty patients underwent the biplanar procedure over the 4 years. Two years follow up showed complete union, full knee range of motion and within the acceptable alignment.

Conclusion: Biplanar osteotomy is an effective method to create the wider inner cancellous surface to achieve better osteotomy site union and knee range of motion.

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1. INTRODUCTION

There is an important relationship between human anatomy and body function [1]. Lower extremity axis is pulled from femoral head center to dome of talus and should pass the center of the knee. Deviation from this axis to lateral is Genu valgum, & deviation to medial is named Genu varum [2]. Regarding osteoarthritis, one common anatomic location belongs to knee joint in which valgus deformity could result in exacerbated load to the lateral compartment, & Genu varum increases the load to the medial compartment [3].

Genu valgum can be approached for corrective osteotomy by the uniplanar or biplanar method, which includes lateral opening wedge & medial closing wedge techniques. Opening wedge osteotomy generally needs bone graft [4,5] which could be unfavorable by the patients at some cases. Femorotibial angulation more than 12 degrees cannot be corrected by tibial varus osteotomy, & should be operated by distal femoral approach [6].

Osteotomy site union and early weight bearing are important factors for successful surgery [7]. A new osteotomy technique around the knee is biplanar osteotomy that in comparison to uniplanar one, brings wider intercancelous bone surface which results in a better union [8]. Another advantage of this method is a creation of smaller wedge volume [9].

At this study we evaluated the efficacy of the biplanar procedure on a group of patients suffering from Genu varum and genu valgum deformity.

2. MATERIALS AND METHODS

In this study, 30 patients were participated including 14 males and 16 females among whom 2 had varus and 28 had a valgus deformity. For all patients standing alignment, X-Ray was done and degrees were measured and need to surgery proved based on LDFA (Lateral distal femoral angle).

2.1 Inclusion Criteria

Geno valgum due to distal femoral misalignment ($80 < LDFA < 94$).

2.2 Exclusion Criteria

Patients that were suffering from concurrent proximal tibia malalignment or limb length discrepancy were excluded from the study.

2.3 Procedure

All patients were operated under spinal anesthesia without tourniquet by the lateral distal femoral approach. Bone was exposed by lateral subvastus approach and osteotomy was performed in metaphysis parallel to joint

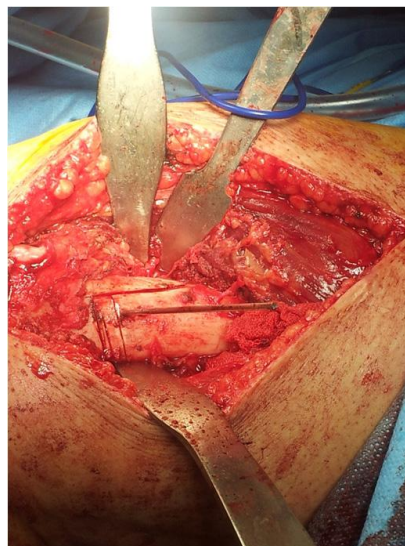


Fig. 1. Intraoperative figure of Biplanar procedure



Fig. 2. Postoperative AP & lateral X-ray

and extended to 2/3 to 3/4 of distal femur width from posterior to anterior (Fig. 1), and its parallelity was checked by C-Arm.

At the next step osteotomy was extended obliquely and proximally about 10 cm to cut anterior cortex, and then any correction was carried out around the anterior cut beak and was checked by C-Arm, and anterior superior iliac spine (ASIS) to ankle axis. For convenience a lag screw is inserted from anterior to posterior, but not completely screwed and correction was made around this location.

The second screw was lagged to secure the corrected alignment, and an anatomical plate of distal femur which was bent to some degree to fit bone curve for fixation (Fig. 2). No bone graft was used at this surgical intervention.

2.4 Postop Protocol

X-ray analysis: 2, 6 and 12 week.

Range of motion: 0 to two week in knee immobilized, then starting ROM weight bearing after 4 weeks, as tolerated by patient.

Achieving range of motion (ROM) for Knee and Weight bearing were started 14 and 28 days after operation respectively. In this condition crutch was put away 2 months afterward. By 6 months, axial alignment view was taken for all patients and final knee ROM, union and alignment were checked.

Follow up for each patient were continued for two years after the surgical intervention.

3. RESULTS

Two cases had severe varus that according to alignment X-Ray degrees was due to distal femur deformity, and 28 were suffering from valgus deformity. All patients gained acceptable postoperative within acceptable alignment (Fig. 3), and had a complete union (Fig. 4) during 3 months without bone graft. No surgical site infection was reported from any participant.

Patients gained full ROM following the procedure. Only one surgical site hematoma was reported 10 days after surgery that led to reoperation, and 3 patients achieved full ROM with delay.

4. DISCUSSION

In this study, all patients achieved full ROM and complete union. All patients had acceptable postoperative alignment with under 7-degree deviation. Based on results of present study and formerly gathered literature, the biplanar osteotomy is an acceptable technique to improve union and postoperative ROM, but still more studies are called to evaluate its advantages and disadvantages.

It's for years that distal femoral and high-tibia osteotomies are used for correction of deformities around the knee [10]. Opening wedge uniplanar osteotomy is of advantage for severe deformities that can lead to limb lengthening, and has the downside of a need to bone graft [11].

Closing wedge osteotomy could be used for mild deformities and can lead into limb



Fig. 3. Postoperative photo of a patient with acceptable alignment



Fig. 4. Complete union after 3 months

shortening [12]. Biplanar osteotomy is a surgical technique to decrease load to lateral compartment of the knee in Genu valgum [13].

In current study 30 cases were operated by lateral distal femoral approach. According to previous studies, because of wider intercancelous, bone surface formation union rate is higher in biplanar compared with single plane osteotomy [14]. By this technique suprapatellar fat is not injured, so postoperative pain is reduced and ROM is better achieved [15]. Bagherifard et al., 2015 showed that biplane distal femur osteotomy is a valid method that creates larger surfaces and further stability at the osteotomy site with more quick union. In addition, Matsui et al., 2014 with report of a 58-year-old healthy woman suffered from right femoral fracture 2 years, revealed that opening wedge distal femoral osteotomy can be a useful technique to remedy knee osteoarthritis related to distal femoral deformity [16]. Yılmaz,

Bakırcıoğlu, 2019 with study of distal femoral valgus deformities with fixator-assisted plating showed that the osteotomy can be applied closer to the joint line in adult patients, thus simple open/close wedge osteotomies can achieve the therapy target [17].

5. CONCLUSION

Long term follows up of patients undergone biplanar procedure showed no wedge resection or insertion. From participants no limb lengthening or shortening following the operation was reported.

CONSENT AND ETHICAL APPROVAL

Ethical aspects of this study were considered in accordance to Helsinki protocol. Informed written consent was taken from all the participants' family or guardians prior to the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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