

# Advantages of the Lateral Approach in Severe Genu Valgus Knee Arthroplasty

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## ABSTRACT

**Introduction:** The treatment of severe valgus is complex. The lateral approach described by Keblish is advantageous for the treatment of these deformities. We decided to evaluate our outcomes using a lateral approach in severe genu valgus knee arthroplasty. **Materials and Methods:** Of 795 primary arthroplasties from January 2012 to March 2020, we analyzed 40 performed by lateral approach. All had a valgus deformity greater than 20° and a sufficient medial collateral ligament. 33 women (3 bilateral) and 4 men were included. Average age was 71 years (59-79). The main cause was osteoarthritis (82%). The presurgical deformity was 27° (21-39). The preoperative measurements were: Knee Society Score (KSS) 15 (5 to 42). Preoperative functional score (KFS): 17 (0 to 40). Average surgical time: 91 minutes. The average postoperative follow-up was 37 months. **Results:** Postoperative femoro-tibial angle 6.2° (range 4° to 10°). Postoperative KSS 79 (46-95). KFS 82 (60-100). Complications: 3 cases (7%), one infection, one case with poor positioning of components, and one case of peroneal neuropraxia. **Conclusion:** In knee arthroplasty due to genu valgus, this approach allows restoring the femoro-tibial axis and achieving adequate prosthetic stability, even with implants without a greater degree of constraint, with a complication rate comparable to other techniques.

**Keywords:** Valgus; lateral approach; arthroplasty; knee.

**Level of Evidence:** IV

## Ventajas del abordaje externo para la artroplastia de rodilla por genu valgo severo

### RESUMEN

**Introducción:** El tratamiento del valgo severo es complejo. El abordaje externo descrito por Keblish es ventajoso para tratar estas deformidades. Evaluamos nuestros resultados utilizando un abordaje externo en artroplastias de rodilla con genu valgo severo. **Materiales y Métodos:** De 795 artroplastias primarias realizadas entre enero de 2012 y marzo de 2020, analizamos 40 que tenían un abordaje externo. Todos los pacientes tenían una deformidad en valgo >20° y un ligamento colateral medial suficiente. Se incluyó a 33 mujeres (3 bilaterales) y 4 hombres, el promedio de edad era de 71 años. La causa fue fundamentalmente osteoartritis (82%). La deformidad prequirúrgica era de 27°. Las mediciones preoperatorias eran: KSS 15 (rango 5-42) y KFS 17 (rango 0-40). El tiempo promedio de cirugía fue de 91 minutos y el seguimiento, de 37 meses. **Resultados:** El ángulo femorotibial posoperatorio fue de 6,2° (rango 4-40°), el KSS posoperatorio fue de 79 (rango 46-95) y el KFS, de 82 (rango 60-100). Hubo tres complicaciones (7%): una infección, un mal posicionamiento de componentes y uno de neuropraxia peronea. **Conclusiones:** En la artroplastia de rodilla por genu valgo, este abordaje permite restituir el eje femorotibial, lograr una adecuada estabilidad de la prótesis, aun con implantes sin mayor grado de constreñimiento, con una tasa de complicaciones equiparable a la de otras técnicas.


**Palabras clave:** Valgo; abordaje externo; artroplastia; rodilla.

**Nivel de Evidencia:** IV

## INTRODUCTION

Valgus deformities treated with knee arthroplasty require a greater degree of surgical complexity. The correct ligament balance and the restoration of the gaps are fundamental objectives during surgery and are essential to achieve a satisfactory outcome with a long-term durability of the implant. In general, due to the frequency of presentation, there is a greater consensus in the literature on how to deal with varus deformity, not so on valgus deformities, where there is no literature with a level of evidence that defines protocols established to treat severe valgus deformities (> 20°).<sup>1,2</sup>

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Regarding the surgical complexity, it is frequently necessary to recognize situations associated with severe valgus, such as hypoplasia of the lateral condyle, partial distention of the medial collateral ligament, external rotation of the tibia, genuflexion, and lateral tibial plateau subsidence. Occasionally, many of these conditions imply the use of implants with a greater degree of constraint, with the mechanical disadvantages that this entails.

Through a simple and reproducible surgical technique, the lateral approach described by Keblish allows resolving cases of severe genu valgus without the need to use, in most cases, a prosthesis with an additional degree of constraint. In trained hands, this approach has a complication rate similar to that of other techniques. Our objective was to evaluate the functional outcomes and complications of patients with severe genu valgus who underwent knee arthroplasty using a Keblish-type lateral approach.

## MATERIALS AND METHODS

Of 795 primary total knee replacements performed between January 2012 and March 2020, 40 patients were included who met the proposed inclusion criteria, which were: a) patients undergoing primary knee arthroplasty, b) diagnosis of genu valgus  $\geq 20^\circ$ , structured and with partial or absolute sufficiency of the medial collateral ligament, corresponding to a grade IIB (according to the modified *Société d'Orthopédie de l'Ouest* classification) (Table 1), c) patients operated on using the same approach and with the same surgical technique, d) patients operated by the same surgical team (trained surgeons with more than 100 knee arthroplasties per year), e) patients operated with a posterior stabilized prosthesis without additional constraint, f) postoperative follow-up  $>12$  months in the same institution where the surgery was performed.

**Table 1.** Modified Société d'Orthopédie de l'Ouest classification<sup>4</sup>

I	Valgus reducible to normal limits. No medial ligament laxity.
II	Fully or partially irreducible, without medial cruciate ligament laxity*
III	Reducible, but with medial collateral ligament laxity
IV	Irreducible with medial collateral ligament laxity

\* We divide it into A: valgus and B: severe valgus, if the angle is  $\geq 20^\circ$ .

## Perioperative management

*Preoperative period:* all patients received the same preoperative management.

*Semiological examination:* measurement of the apparent femorotibial angle, the flexion-extension arc, and the degree of ligament sufficiency using a goniometer. The medial collateral ligament was considered insufficient when no end point was found in the valgus stress test.<sup>3</sup>

*Classification of the deviation:* according to the classification of the *Société d'Orthopédie de l'Ouest*.<sup>4</sup>

*Measurement of clinical and functional parameters:* according to the *Knee Society Score* (KSS) and the *Knee Functional Score* (KFS).<sup>5</sup>

*Radiographic examination :*

- Anteroposterior and lateral radiographs with bipedal weight-bearing (in these, the radiographic anatomical axes are measured)

- Patella axial radiograph

- Varus-valgus stress radiographs to quantify the degree of ligament sufficiency

*Surgical technique:* dorsal decubitus position. Spinal Anesthesia. Without hemostatic cuff. Median anterior approach with the knee flexed. Dissection and lateral parapatellar arthrotomy, through an incision of 5 cm above the superior patellar pole, up to the level of the anterior tibial tuberosity. A lateral flap is then raised (with the leg flexed and intrarotated); the iliotibial band, the proximal part of the tibialis anterior muscle, and the posterolateral capsuloligamentary structures are disinserted below the periosteum with a chisel or scalpel. It is important to note that this surgical step allows correcting the external rotation that, in general, is associated with valgus deformities. Important aspects of the surgical technique: a) conservation of Hoffa's fat pad (important for the final closure of soft tissue), b) dissecting the peroneal nerve is not necessary, c) unlike the original technique described by

Keblish,<sup>6-8</sup> we do not consider it necessary to osteotomize the anterior tibial tuberosity; we did not find additional difficulty dislocating the patella. The tibial bone cut is made with an anatomical extramedullary guide (right and left). The femoral bone cuts are made taking the epicondylar line or the tibial cut as a reference, without taking into account the posterior condyles due to the already known association of lateral condyle hypoplasia in valgus deformities. The intrasurgical control of ligament balance was very meticulous (only in 5 cases, an epicondyle osteotomy or a popliteal tendon release was necessary to achieve this balance).<sup>8</sup> Cementation of the components with a manual pressurization technique and pulse lavage. Placement of the tibial component in neutral rotation and of the femoral component coinciding with the epicondyle line.<sup>8</sup> In all cases, a posterior-stabilized total knee prosthesis was implanted. Inverted plane closure with the knee flexed at 90° (using Hoffa's fat pad as coverage of planes).

*Postoperative:* Mobility of the knee with the kinesiology team from the first day after surgery, walking with a walker from the second postoperative day and for 30 days, date on which the support is discontinued. A radiographic control is performed and the KSS is determined at 3, 6, 12 months, and once a year, for life.

### Analyzed Parameters

- Age
- Sex
- Misalignment etiology
- Average surgical time measured in minutes (from the beginning of incision to closure)
- Preoperative and postoperative functional measurement according to the KSS and KFS
- Radiographic measurement of misalignment correction
- Average follow-up, with a minimum of 12 months
- Complications

### FINDINGS

37 patients (40 cases) were included under the proposed inclusion criteria. 90% (33 patients) were women and 10% (4 patients) were men, with an average age of 71 years (range 59-79). The misalignment etiologies were: 33 cases of primary osteoarthritis with constitutional misalignment (82.5%), four cases with a history of rheumatoid arthritis (10%), two patients with sequelae of tibial plateau fracture (5%), and one with sequela of a proximal tibial osteotomy (2.5%). The average surgical time was 91 min (range 62-102). The preoperative KSS functional measurement was 15 (range 5-42) and the KFS, 17 (range 0-40). The postoperative KSS functional measurement was 79 (range 46-95) and the KFS, 82 (range 60-100) (Table 2).

**Table 2.** Outcomes

Quantity (Male / Female)	40 (4/33) 3 bilateral
Preoperative deformity	27° (range 21-39 °)
Postoperative correction	6.2° (range 4-10 °)
Age	71 years (range 59-79)
Surgery time	91 min (range 62-102)
Preoperative KSS	15 (range 5-42)
Postoperative KSS	79 (range 46-95)
Preoperative KFS	17 (range 0-40)
Postoperative KFS	82 (range 60-100)
Follow-up	37 months (range 12-72)

KSS = Knee Society Score, KFS = Knee Functional Score.<sup>5</sup>

The radiographic measurements to correct the misalignment were: average preoperative femorotibial angle: 27° valgus (range 21-39) and average postoperative femorotibial angle: 6.2° valgus (range 4-10) (Figures 1 and 2).

The average follow-up was 37 months (range 12-72). There were three complications (7%): a chronic infection that required a two-stage revision of the prosthesis, an implant mispositioning (femoral component in varus) that did not require a new intervention due to the good clinical evolution, and a transitory peroneal nerve paresis that disappeared *ad integrum* at the 6-month follow-up.



**Figure 1.** Right genu valgum. Preoperative misalignment and control with axis correction 3 months after surgery. Preoperative radiographs with 20° valgus and Ahlbäck IV osteoarthritis and radiographic control 3 months after surgery.



**Figure 2.** Bilateral genu valgum. The patient underwent surgery on each knee 6 months apart. The previous valgus deformity was  $21^{\circ}$  on the right knee and  $24^{\circ}$  on the left. Control in the office 4 months after surgery. Control radiographs after 10 months on the left knee and after 4 months on the right.

## DISCUSSION

The surgical management of valgus malalignment of the knee is a controversial issue and there are few reports in the updated literature. Although in recent years the published studies on this topic have increased, the level of evidence still does not allow us to define the definite management of these deformities. The most controversial questions in the surgical treatment by means of arthroplasty in patients with severe genu valgus that still do not have conclusive answers are: intra-surgical management of the ligament balance (with its different technical options) and the need to use implants with additional constraint.<sup>9</sup>

In our series, after the lateral approach described by Keblish (even with modifications of the original technique already described in the Surgical Technique section), we observed that the malalignment correction was satisfactory, a correct postoperative femorotibial axis was achieved (6.2° on average) and it was not necessary to use constrained implants. Likewise, we did not have technical difficulties in patients with scars related to previous surgical procedures. The improvement in the measured functional scores was remarkable and they were comparable with those of other surgical techniques.<sup>10</sup> It is important to note that, if necessary, this approach allows additional surgical steps to be performed to improve ligament balance and prosthesis stability, for example, a lateral epicondyle osteotomy. In our series, it was necessary in five cases. Another advantage in relation to the ligament balance and the restoration of the gaps is that, unlike the conventional approach through medial arthrotomy, in the lateral approach, the capsuloligamentary elements are not released, thus avoiding surgical steps on the medial side that could damage the medial collateral ligament or aggravate a pre-existing injury. In our series, we did not have to resort, in any case, to actions aimed at increasing the “medial retension” described in the literature. The complication rate was 7.5%; however, the patient with infection (2.5%) was reoperated. In this sense, the cause of the infection is not directly attributable to the approach or technique used. One of the critical points in this approach is the lack of coverage in the incision area and the difficulty involved in wound closure and adequate implant coverage. However, preserving Hoffa’s fat pad at the beginning of the approach allows it to be sutured at the time of closure. If necessary, a Hoffa’s fat pad flap can be made, releasing it at its medial insertion, allowing it to be externally rotated and thus covering the defect area without difficulty. With this maneuver, a vascularized pedicle is maintained, giving vitality to the “rotating flap”. In our series, we had to conduct this in two cases and we did not observe complications related to it.

In no case was it necessary to release the medial retinaculum. According to published reports, lateral release is necessary in cases of severe valgus.<sup>11,12</sup>

We believe it is appropriate for the surgeon to become familiar with this approach before applying it in cases of severe malalignment. We had to correct the tibial cut in seven of our first 20 cases because we observed an unacceptable (varus) cut under fluoroscopic control. We recommend the use of intraoperative fluoroscopy once the test implants have been placed. This simple action is useful to control undesirable technical errors, especially from surgeons less trained in the described technique. The limitation of this study is the small number of cases, although it is known that this type of deformity is less frequent in general. Large case series have not been published in the international literature and neither have comparable reports in national publications.

The lateral approach in total knee replacement is a useful surgical alternative for the management of patients with severe valgus deformity and sufficiency of the medial collateral ligament. It allows to correct large deformities without complex surgical procedures and to use conventional implants without having to increase the degree of constraint.

Although it implies a learning curve, fundamentally related to the low popularity of this approach, in trained hands, the results are comparable to those of other techniques. Aside from a low rate of complications, its main advantage is the use of primary implants without an additional level of constraint.<sup>13,14</sup>

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