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ORIGINAL ARTICLE

Distal femoral varus osteotomy outcome: Is associated femoropatellar osteoarthritis consequential?

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KEYWORDS

Knee;
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Summary

Introduction: Distal femoral varus osteotomy (FVO) can be indicated for young active patients who have lateral unicompartmental osteoarthritis in a valgus knee originating in the femur. However, its indication remains controversial when associated patellofemoral osteoarthritis is present.

Hypothesis: Associated patellofemoral osteoarthritis influences the results of osteotomy in cases of lateral tibiofemoral osteoarthritis.

Methods: Twenty patients (22 knees) underwent opening wedge FVO for lateral tibiofemoral osteoarthritis of a valgus knee. The osteoarthritis was lateral and unicompartmental in 11 cases, associated with patellofemoral osteoarthritis in nine cases, and global in two cases. The osteotomy site was fixed with a 95° blade plate in all cases. At a mean follow-up of 54 months, all the patients were evaluated using the International Knee Society (IKS) score.

Results: Eighteen knees had good or excellent results (80%), two had fair results (9.5%), and two had poor results (9.5%). One female patient underwent total knee replacement revision at 8 years and three others are awaiting total knee replacement. The mean preoperative IKS score increased from 49.28 (range, 14–70) to 74.23 (range, 41–92) at the last follow-up. The mean preoperative functional score increased from 50.68 (range, 30–80) to 72.85 (range, 40–90) at the last follow-up ($p = 0.001$). The 8-year survival rate was 91% (confidence interval, 69–100%). We noted improvement in patellofemoral syndrome and recentering of the patella in seven cases out of nine with severe patellofemoral osteoarthritis.

Conclusion: Distal femoral varus osteotomy, with lateral opening wedge and fixation can be a good alternative to treatment of lateral tibiofemoral osteoarthritis associated with a valgus knee originating in the femur. The association of patellofemoral osteoarthritis does not affect the functional results.

Level of evidence: Level IV. Retrospective study.

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Introduction

In gonarthrosis in a valgus knee, the deviation triggers an imbalance between the mechanical axis aligning outside of the knee's center and overload, leading to alteration of the cartilage of the lateral compartment [1–3]. Today's medical treatment can only remove pain temporarily [4,5] because medications, infiltrations, physical therapy, weight loss, and activity reduction act only on symptoms. Progress in total or partial knee arthroplasty remains insufficient to provide long-lasting support for substantial activity in young active patients. Femoral varus osteotomy (FVO) is an alternative. However, the results of this procedure vary greatly [5–8]. It has been suggested that associated patellofemoral osteoarthritis would be a contraindication to FVO [9,10]. Does the presence of patellofemoral osteoarthritis modify the functional results of FVO?

Patients and methods

This continuous retrospective study was conducted on 23 patients (26 knees) with lateral femorotibial osteoarthritis and operated with lateral opening wedge FVO [11] in the Charles Nicolle Hospital Orthopaedics and Traumatology Department in Tunis, Tunisia, over a period of 14 years between January 1994 and December 2007. Twenty patient files (22 knees) were retained, all responding to the inclusion criteria (complete radiological workup, minimum 3 years of follow-up, a single surgical technique): 13 females and seven males; mean age at surgery, 53 years (range, 27–66 years). All the patients had a uni- or bilateral symptomatic valgus knee, constitutional in 17 cases (19 knees) and post-traumatic in one case, sequelae of poliomyelitis in one case, and a malformation with multiple epiphyseal dysplasia in one case. Eleven patients had unilateral involvement and nine had bilateral involvement.

The preoperative IKS score was 49.28 points (range, 14–70 points). The mean preoperative functional score was 50.68 points (range, 30–80 points). Nine patients (45%) presented associated patellofemoral syndrome before the intervention.

All the patients had a complete pre- and postoperative radiological workup, as well as at the last follow-up. This

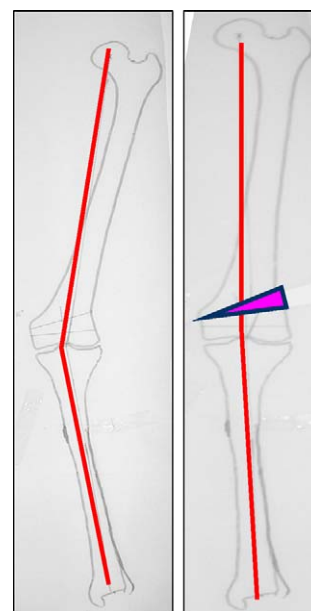


Figure 1 Corrective wedge prepared before the intervention.

included AP and lateral X-rays with load, a patellofemoral radiograph at 30° of flexion, a telemetric X-ray with load of the lower limbs, using the true lateral X-ray technique according to Ramadier et al. [12].

According to the Ahlback classification [13], two knees (9%) were stage I, 10 patients (45.4%) were stage II, eight patients (36.3%) were stage III, one patient (4.5%) was stage IV, and one patient (4.5%) was stage V. The mean preoperative mechanical tibiofemoral angle was 194.5° (range, 188°–198°). Patellofemoral osteoarthritis was present in nine patients.

The deformity was corrected using a wedge design based on the telemetric X-ray images of both lower limbs with load (Fig. 1). Our objective was to retain residual valgus knee ranging from 2° to 3°.

The surgical technique consisted of a lateral opening wedge osteotomy of the femur, with no grafting, using a blade plate bent to 95° (Strelitzia-type blade plate (Fig. 2) in 21 cases and an AO-type blade plate in one case). A lateral approach was used in all cases. A 25 mm epiphyseal guide pin

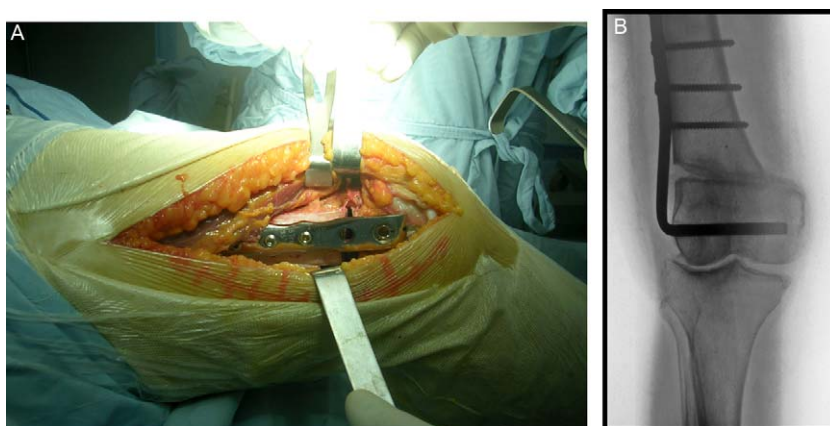


Figure 2 A: operative view, plate in place. B: AP X-ray of the knee after osteotomy showing lateral gap and medial interpenetration.

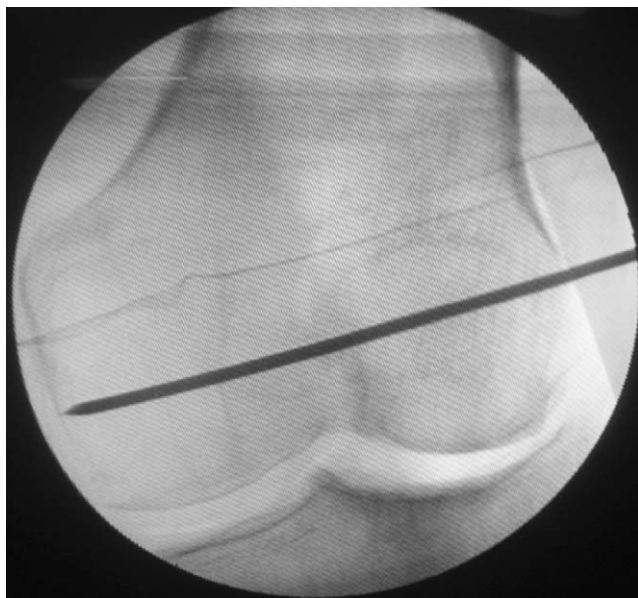


Figure 3 Preoperative X-ray: the guide pin of the blade plate is inserted parallel to the joint line.

was inserted into the joint space with radioscopic guidance (Fig. 3) using an angle finder applied to the diaphysis. The course of the blade was prepared using a nail starter before proceeding to the osteotomy. Another pin was placed 50 mm from the joint space, indicating the level of the osteotomy (Fig. 4), using the saw on the lateral, anterior, and posterior cortices (Fig. 5). The first centimeters of the blade plate were driven in with particular attention paid to keeping the plate parallel in the frontal plane (Fig. 2). The angle correction was verified and then the blade plate completely driven in. Radioscopic verification confirmed that the contact of the medial cortices was satisfactory.

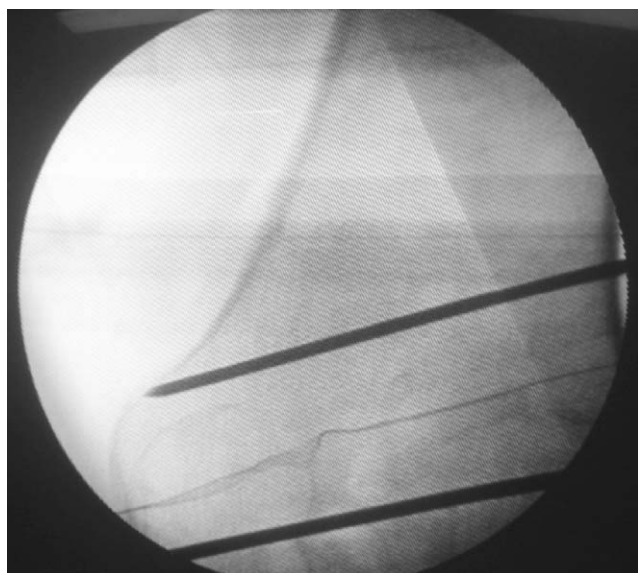


Figure 4 Intraoperative X-ray showing the position of the second guide pin parallel to the joint line. Distal aspect of the femur parallel to the joint space.



Figure 5 Femoral osteotomy line parallel to the course of the blade plate above the patellofemoral joint.

In cases of associated patellofemoral osteoarthritis or lateral incomplete dislocation of the patella, the lateral patellar retinaculum was released. The knee was mobilized early in the first weeks following surgery, associated with crutches with no weightbearing for 3 months, followed by progressive weightbearing depending on healing as observed on X-rays.

The clinical evaluation method was founded on the IKS score [2]. Data recording and statistical analysis were done using SPSS11 software. The differences in variables were analyzed using the Student *t*-test for quantitative variables and the Chi² for qualitative variables. *P*-values less than 0.05 were considered statistically significant.

Results

The mean follow-up was 54 months (range, 36–132 months). A hematoma was noted in one patient, which regressed spontaneously with no sequelae. The mean time to union was 14 weeks (range, 12–20 weeks). One patient presented delayed union (5 months).

The mean knee score at the last follow-up was 74.23 points, with a mean increase of 25 points ($p < 0.001$). The mean function score at the last follow-up was 72.85 points, with a mean increase of 22.17 points compared to the preoperative score ($p = 0.001$). Eighty percent of the patients were satisfied at the last follow-up.

The mean pain score at the last follow-up showed a mean improvement of 26 points (range, 12.72–38.4 points) ($p < 0.001$). The mean mobility score decreased from 23.22 before surgery to 21.95 at the last follow-up. This decrease was attributable to stiffness observed in a patient who had a post-traumatic osteochondral lesion.

The best results were observed in patients with constitutional valgus knee (17 cases). The low numbers of other etiologies (poliomyelitis sequelae, one case; post-traumatic, one case; multiple epiphyseal dysplasia, one case) precluded any comparison.

The mean postoperative HKA angle was 181.5° (range, 177–186°). At the last follow-up, 12 knees had a correction between 0 and 6° valgus, four patients (eight knees) had

Table 1 Results in relation to patellofemoral osteoarthritis.

Initial patellofemoral osteoarthritis	Visual analog scale	Knee score	Function score
Yes	9	9	9
No	13	13	13
χ^2	$p=0.658$	$p=0.806$	$p=0.193$

an overcorrection but not beyond 3° varus, with no repercussions on the medial femorotibial compartment, and two patients (two knees) were overcorrected with residual valgus greater than 6°.

The mean lateral femoral angle increased from 69.63° preoperatively to 82.81° immediately after surgery (range, 77–88°) and to 81° at the last follow-up (range, 75–87°).

The patients with residual valgus between 0 and 6° had better results, although this was not statistically significant ($p=0.616$).

At the last follow-up, the patients with associated patellofemoral osteoarthritis had a comparable result to the other patients (Table 1) (Fig. 6). Patella recentering was observed in seven patients with an increase in the preoperative Insall and Salvati index from 1.07 to 1.15 at the last follow-up. Patella recentering was observed in the cases in which the HKA angle showed a normal axis.

Discussion

The role to be played by FVO in treating patients with lateral femorotibial gonarthrosis in the presence of patellofemoral osteoarthritis remains controversial. It has been reported that patellofemoral osteoarthritis is a contraindication for

FVO [9,10]. In the coronal plane, distal varus osteotomy decreases the Q angle between the quadriceps tendon and the patellar tendon, which reduces the outcome of the patella's lateral traction forces [14,15]. Theoretically, incomplete lateral dislocation of the patella could be reduced and the patella recentered in the femoral trochlea after FVO [14]. In the treatment of combined patellofemoral and lateral tibiofemoral osteoarthritis, Maquet [14] associated FVO with advancement of the anterior tibial tuberosity. In the present study, for nine patients with patellofemoral osteoarthritis, treatment consisted in lateral release associated with the FVO. In these patients, the functional results were satisfactory and patella recentering was demonstrated radiologically (seven cases) at the last follow-up.

Conservative surgical treatment of lateral tibiofemoral gonarthrosis with osteotomy remains infrequent. This is explained by the good tolerance of this type of gonarthrosis, which, according to Goutallier et al. [16], triggers few symptoms if the knee is stable. These arthroses only become problematic at advanced stages, which then require total knee arthroplasty. In our series with a mean age of 53 years, the knee's valgus deformity was a mean 14° and 80% of these patients were manual laborers. The alternatives of unicompartmental or total knee implants are not acceptable.

According to many authors, femoral osteotomy reduces the technical problems if secondary arthroplasty is needed and even allows one to prepare for this in favorable conditions [17–19]. In the literature review few series study FVO and they are small [17,20–23]. These small numbers show how rare this procedure is compared to valgus tibial osteotomy. During the period covered by the present study (13 years), 1000 cases of gonarthrosis were operated in the Charles Nicolle Hospital Orthopaedics and Traumatology department: 32.9% underwent total knee arthroplasty, 65.4% had tibial valgus osteotomy for medial tibiofemoral osteoarthritis, and only 2.3% underwent femoral varus osteotomy for lateral femorotibial gonarthrosis. The mean age of our series at surgery corresponds to the data reported in the literature [17–19,22–25].

The correction angle necessary to relieve lateral tibiofemoral gonarthrosis over the long term is the subject of controversy. Some authors recommend undercorrection and retain 2–4° valgus knee [26–28]. Others [1,10,29] recommend normal correction or even varus overcorrection to remediate the loss of correction. In the series reported herein, we noted that the percentage of excellent and good results was better in patients with a correction between 0 and 6° valgus. We observed filling of the lateral opening around the 6th month. Langlais and Lambotte [30], who described the role played by a lateral tension plate in stabilizing the hip and knee, advise a moderate correction of the valgus knee and describe the harmful effects of postoperative varus knee, which should be compensated by

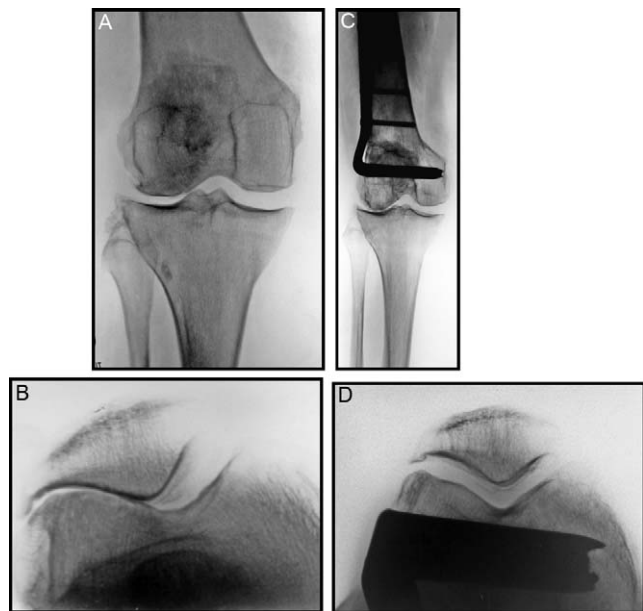


Figure 6 A–D: Female patient, 52 years of age. A: standing AP image and B: patellofemoral image showing osteoarthritis of the lateral and patellofemoral compartment, with 12° valgus deformity. C: post op AP view; D: merchant view showing centering of the patella.

increased traction from the lateral tension plate, increasing the stresses on the lateral compartment (by increasing the varization time), responsible for flexion deformity of the knee.

Conclusion

Distal femoral varus osteotomy is indicated in lateral gonarthrosis of the valgus knee originating in the femur if there is no medial femorotibial osteoarthritis in young active patients who are not severely overweight.

The result of osteotomy does not seem to be modified by associated patellofemoral osteoarthritis.

Conflict of interest statement

None.

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