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## Mid-term outcomes of osteotomy of the proximal tibia for knee arthrosis in Togo

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### Abstract

**Introduction:** Knee osteoarthritis is a common and disabling degenerative condition. The aim of the treatment is to reduce the stress on one compartment of the knee. Our objective was to evaluate the anatomical and functional results of surgical treatment of axial deviations in Togo.

**Patients and Methods:** This is a retrospective study over 12 years with a descriptive component. It included 43 patients (55 knees) who underwent internal opening-wedge or lateral closing-wedge osteotomy of the proximal tibia (PTO) in the five hospitals in Togo. The evaluation of functional results was subjective and objective with the IKS function and examination score, the Lyshom Tegner score and the Tegner Rating. Survival was evaluated by considering the indication for knee prosthesis as failure.

**Results:** There were 28 women and 15 men whose average age was 46.39 years [18-70]. The Alhback Stage was distributed as follows: Stage I at 42.11%, Stage II at 15.79%, Stage III at 39.47% and Stage IV at 2.63%. 30 (PTO) of internal opening, 10 (POT) of lateral closing-wedge and 3 internal closing-wedge were carried out. The average follow-up was 94.50 months (8-168) or 7 years and 10 months. The patients were 91.89% satisfied with the intervention. Scores averaged 79.77 [35-100]. (35-100) for the IKS exam, 85.41 [40-100] for the IKS function, and 84.84 [29-100]. for the Lyshom-Tegner. Tegner's average rating was 3.74 [1-7].

**Conclusion:** With a follow-up of 8 years, we found excellent functional results. The survival rate was excellent although this remains to be qualified, although knee prosthesis is available, it remains difficult to access in Togo. These results can be improved by taking preoperative health and diet measures.

**Keywords:** Gonarthrosis, axial deviation, tibial osteotomy, functional results, Togo

### 1. Introduction

Knee osteoarthritis is a common and disabling degenerative condition <sup>[1]</sup>. Surgical treatment is dominated today by arthroplasty. Accessibility to arthroplasty implants remains difficult in sub-Saharan African countries due to structural difficulties. However, unicompartmental gonarthrosis with axial deviation admits conservative treatment, and constitutes an alternative to arthroplasty <sup>[2-4]</sup>. Consequently, osteotomies of the proximal tibia valgus (PTV) aim to correct an axis defect and reduce the stress on one compartment of the knee. The relief obtained was the basis for a multiplication of indications <sup>[5]</sup>. In our context of a country with low coverage, knee osteoarthritis is also common <sup>[6, 7]</sup>, which was the subject of a study on the surgical management of valgus and varum knees. Our objective was to evaluate the anatomical and functional results of surgical treatment of knee osteoarthritis in Togo. Our hypothesis is that the anatomical and functional results are satisfactory in the medium term, after an osteotomy of the proximal tibia performed.

### 2. Patients and Methods

**2.1 Patients:** This is a multicenter descriptive cross-sectional study with a retrospective component, conducted between January 1, 2007, and December 31, 2019. This work was carried out in the five hospitals centers in Togo. It consisted of patients for whom an osteotomy was performed on the proximal tibia. All patients whose treatment was a opening-wedge or closing-wedge osteotomy of the proximal tibia with a follow-up of more than 6 months were included in this study. There were 43 patients, i.e. 55 knees, 28 of which were bilateral.

Twenty-six patients had varum knee, 12 valgum knee, 4 traumatic sequelae, Blount's disease.

The sample consisted of 28 women and 15 men whose median age was 46.39. The average body mass index was 29.14 with extremes of 17 and 54. Sixteen patients (39.02) were obese, fourteen (34.15%) were overweight and eleven (26.83%) had a normal BMI. The reason for consultation was knee pain in forty patients (93.02%), aesthetic discomfort in 5 patients (11.62%) and instability in 2 patients (4.65%).

All patients underwent standard radiography and pangenometry (Fig 1). The angular deviation to be corrected (DAC) found in the Pangenogram, depending on the affected side, was 12.68 degrees on the right (4-33) and on the left 14.84 degrees.

Alhback stages I and III were the most represented in 31 cases (Table1). The internal compartment was affected in 38 patients, 20 patients had patellofemoral osteoarthritis and 16 patients had involvement of the external compartment.

The average IKS function score was 79.77.

**Table 1:** Distribution of different degrees of joint narrowing according to the Alhback classification

|           | Number | Percentage |
|-----------|--------|------------|
| Stage I   | 16     | 42.11      |
| Stage II  | 6      | 15.79      |
| Stage III | 15     | 39.47      |
| Stage IV  | 1      | 2.63       |

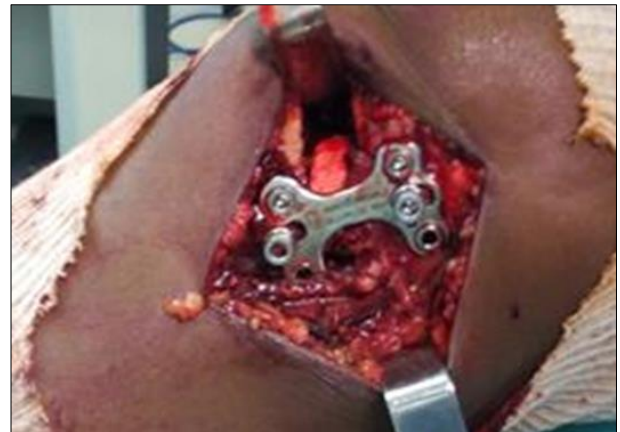


**Fig 1:** Pigeongram under load

## 2.2 Therapeutic protocol

Under general or regional anesthesia, patients were placed in the supine position with popliteal support. A tourniquet (Pneumatic or Esmach band depending on the teams) was placed at the root of the limb. The internal and external Gernez anteromedial approach have been initiated for the different types of osteotomies. The level of the medial proximal tibial osteotomy was 4 cm below the tibial plateau.

The external hinge is preserved or at most started with a few blows using a striking chisel under scopic control for certain hospitals. The correction will be made by placing successive wedges until the desired correction is reached, fixed by an OTIS plus plate (Fig 2).



**Fig 2:** Fixing the correction with an Otis Plus plate

On the other hand, the proximal tibial valgus osteotomy by external subtraction was performed above the tuberosity. The inner cortex was preserved and was only weakened at the time of correction. The means of fixation were varied. The Kerboul screwed plate, the AO screwed plate and the locked screwed plates or Locking compression plate (LCP) were used. The closure was done on a tubular suction drain, put in place for two days.

Anti-thrombotic prophylaxis with low molecular weight heparin was systematic. Systematic antibiotic prophylaxis was done with amoxicillin combined with clavulanic acid. The drain was removed on the second postoperative day.

## 2.3 Evaluation of results

It was established by surgeons. It was clinical, radiological and carried out on the 45th day, 3rd month, 6th month, and every year. The decline was evaluated from the date of intervention. We considered the indication for total knee arthroplasty as a failure. Satisfaction was assessed by a question with a yes or no answer.

The evaluation of functional results was made according to the International Knee Society (IKS) [8] scores, Lyshom-Tegner [9] and the Tegner rating [10]. The results were ranked according to the score:

- Excellent for a score between 85-100
- Good for a score between 70-84
- Average for a score between 60-69
- Bad for a score below 60.

Patients were contacted by telephone. An appointment was made to note the functional results. Those not available were interviewed by telephone with collection of IKS Lyshom-Tegner function scores and Tegner rating. In total: 39 patients were seen again, including 21 by telephone and 4 lost to follow-up. Statistical analysis was performed using EPI INFO software version 7 2 2 6 (CDC Atlanta).

## 3. Results

The average follow-up was 94.50 months [8-168]. All patients consolidated within 6 months (Fig. 3)

We found a case of intra-operative fracture of the lateral tibial plateau (Fig 4)



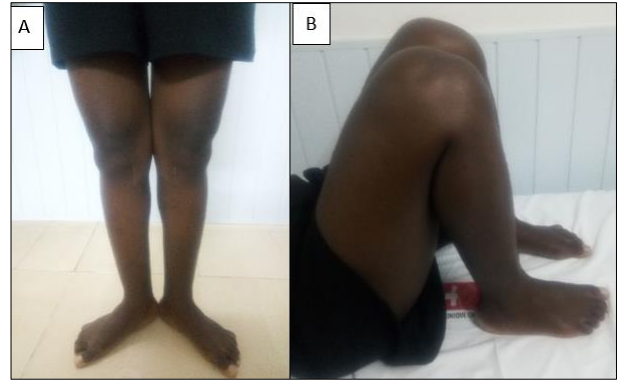
**Fig 3:** Control radiograph at the last follow-up of the different osteotomies, A) External closure valgus osteotomy, B) Internal opening valgus osteotomy



**Fig 4:** Iatrogenic fracture of the lateral tibial plateau.

**3.1 Functional results**

Knee mobility at the last follow-up in the patients reviewed (fig.5) was on average 113.33 degrees of flexion.



**Fig 5:** (A) normo-axial knee; (B) Knee flexion

The average IKS function score was 85.41, for the 39 patients who were reviewed (Table III).

**Table 3:** IKS function score at last follow-up.

|           | Number | Percentage % |
|-----------|--------|--------------|
| Excellent | 28     | 71.79        |
| Bon       | 6      | 15.38        |
| Moyen     | 2      | 5.13         |
| Mauvais   | 3      | 7.69         |

**Satisfaction**

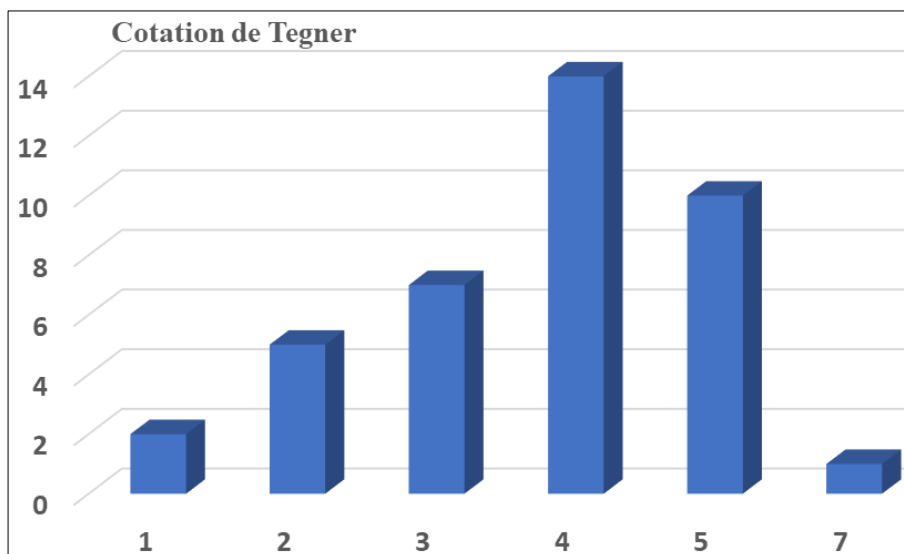
Thirty-five (35) patients (91.89%) declared themselves satisfied, compared to 8.11% who were dissatisfied. Thirty knees (70.27%) were painless according to VAS. Residual pain was observed in 13 (29.73%) patients.

**Score Lyshom Tegner:** The average score was 88.84 [29-100], at last follow-up (Table IV).

**Table 4:** Lyshom Tegner score at last follow-up.

|           | Number | Percentage % |
|-----------|--------|--------------|
| Excellent | 22     | 56.41        |
| Bon       | 5      | 12.82        |
| Moyen     | 7      | 17.95        |
| Mauvais   | 5      | 12.82        |

**Tegner rating:** The average Tegner rating was 3.74 [1-7], at last follow-up (Fig 6).



**Fig 6:** Tegner rating

## 4. Discussion

### 4.1 Sample characteristics

The average age of the patients in our series was lower than that found in the literature [9, 11-13]. PTO was mostly performed in patients under 65 years of age [12]. No correlation was established between the result of the osteotomy and the age of the patients at the time of the intervention according to Dubrana [14]. We therefore believe like other authors [14] that age in our working conditions should not limit the indications for proximal tibial osteotomy due to the low socio-economic level, linked to the impoverishment of the population.

Osteoarthritis genu varum was frequently found more in females, just as in other series [13]. Female gender constituted a risk factor favoring femorotibial gonarthrosis from the age of 50. This is explained by the chondroprotective role of female sex hormones [15].

### 4.2 The knee osteoarthritis stage

Stage I was found mainly in our series as in that of Belmoubarik [16]. Several authors (Table V) have reported in their series the frequency of Alhback stages II and III. The indication was made early in these patients. Those followed privately were able to honor treatment on time.

**Table 5:** Alhback stages found in the different series.

|                     | n   | I      | II     | III    | IV    | V     |
|---------------------|-----|--------|--------|--------|-------|-------|
| Ben Jaafar [13]     | 100 | 8%     | 65%    | 27%    | 0%    | 0%    |
| Raboudi [17]        | 65  | 7.70%  | 64.70% | 23%    | 4.60% | 0     |
| Sarabia-Condes [18] | 42  | 4.70%  | 65.10% | 25.60% | 0.00% | 0.00% |
| Nakamura [19]       | 33  | 0      | 3%     | 52%    | 45%   | 0%    |
| Belmoubarik [20]    | 28  | 68.40% | 26.30% | 5.20%  | 0%    | 0%    |
| Our series          | 43  | 43.90% | 14.63% | 39.02% | 2.44% | 0%    |

### The degree of correction

The DAC in our series was higher than that of the other series (Table VI). This can be explained by the fact that patients consult at an advanced stage of knee osteoarthritis for various reasons: difficulties in taking care of themselves, the absence of universal health insurance.

**Table 6:** Corrected angular deviation in the series

|                          | Year | N   | DAC   | Intervals |
|--------------------------|------|-----|-------|-----------|
| Ben Jaafar [13]          | 2016 | 100 | 10.39 | (3-18)    |
| Raboudi [17]             | 2013 | 41  | 11.19 | (5-17)    |
| Nerhus [21]              | 2017 | 70  | 9.7   | (5-17)    |
| Van Wulfften Palthe [22] | 2018 | 223 | 5.6   |           |
| Belmoubarik [20]         | 2015 | 28  | 11.3  | (8-18)    |
| Our series               | 2019 | 43  | 13.76 | (4-34)    |

### 4.3 Functional results at final follow-up

#### Knee mobility

Knee mobility at last follow-up in the patients reviewed was on average 113.33 degrees of flexion. Song [23] found a postoperative flexion of 137° Raboudi [17] found a flexion greater than 110° for 97% of his patients.

Maintaining or even improving knee flexion should be attributed to early rehabilitation with stable osteosynthesis. We believe, like some authors [9], that flexion less than 90° and flexion greater than 20 degrees should be contraindications to conservative surgery for knee osteoarthritis. However, the functional results measured with the different scores show good results in our series and in the literature (Table VII).

Our good results can be explained by the techniques used which are validated and by the follow-up which is average. Bastard *et al.* [19] found in patients under 60 years of age a return to sporting activities at a maximum of 1 year with a level equal to or higher than the preoperative one. Several authors have reported excellent results at final follow-up [11, 16, 24].

**Table 7:** Functional result at the last follow-up in the different series.

|                          | n       | IKS knee | IKS Function | Score LT | Rating Tegner |
|--------------------------|---------|----------|--------------|----------|---------------|
| Ben Jaafar [11]          | 100     | 64.74    | 62.15        | -        | -             |
| Raboudi [9]              | 65      | -        | -            | 84.57    | -             |
| Nerhus [24]              | 70      | -        | -            | 72.2     | 3             |
| Van Wulfften Palthe [12] | 125     | -        | -            | 75.5     | 3             |
| Brosset [20]             | 41      | 90       | 95           | -        | -             |
| Sarraglia [25]           | 124     |          | 86           | 88       | -             |
| Our series               | 39 (18) | 79.77    | 85.41        | 84.84    | 3.74          |

### Patient satisfaction

In the literature, a high rate of subjective patient satisfaction after proximal tibia osteotomy has been reported [9, 21, 25, 26]. The same findings were revealed in our series. In our study, a patient in whom TKA had been indicated and not performed for economic reasons was unhappy.

### Complications

The complication of external tibial plateau fracture during internally opened PTO has also been reported by several authors [22, 11, 25, 27]. It occurs when the osteotomy line does not come into contact with the cortex. The risk factors linked to the occurrence of a complication listed in the literature are obesity and the importance of the correction [23, 28]. It is recommended to leave a minimum thickness of 2 cm of tibial epiphysis and to use the postage stamp technique under scopic control with a drill bit to avoid diffusion of the line towards the endplates.

### 5 Conclusion

Unicompartmental gonarthrosis of the knee is a common condition in our work context. Proximal tibia osteotomies were proposed for our patients. In our study, we found a young population concerned and predominantly composed of women. The failure rate was low although this remains to be qualified by the fact that the total knee prosthesis is still not easily accessible although available in Togo.

The functional assessment was satisfactory with the IKS and Lyshom Tegner scores. Our patients had activity at last follow-up assessed by the Tegner rating compatible with the activities they practiced. These results can be improved by taking preoperative hygiene and diet measures.

**Conflicts of interest:** None

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