



Total Knee Arthroplasty: Epidemiology and Statistics of 8 Years of Experience

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Abstract

Introduction: Total Knee Arthroplasty (TKA), stands out as one of the greatest successes in orthopedic surgery. It involves the prosthetic replacement of all femoro-tibial and/or femoro-patellar compartments. This article aims to analyze the epidemiological and statistical data concerning TKAs performed in our institution.

Materials and Methods: We conducted over 8 years, a retrospective study with a descriptive aim on 789 total knee arthroplasties at the Mohammed V Military Training Hospital (HMIMV) in Rabat, Morocco. The variables studied included sociodemographic characteristics, clinical data, and sizes used in the different implants.

Results: The average age was 67 ± 7.5 years. Female represent 70% of the patients. The right side was affected in 51.4% of cases. Patients underwent surgery for primary gonarthrosis in 679 cases.

Femoral implants of sizes D, E, 3 and 2.5 are predominantly used in females, whereas sizes F, G, 4 and 5 are predominant in males. For tibial implants, size 3 is most common among females, while size 5 is most common among males. The most commonly used thickness in PE is 9 mm.

Discussion: The average age of patients was 67 years, similar to other studies. A female predominance and the use of different implant sizes by gender were observed, with primary gonarthrosis as the main indication.

Conclusion: This study contributes to the existing literature by providing detailed epidemiological and clinical data on TKA in a Moroccan context. She also emphasizes the importance of traceability and management of medical devices to optimize surgical results.

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Introduction

Total Knee Arthroplasty (TKA), also known as Total Knee Replacement (TKR), stands out as one of the greatest successes in orthopedic surgery. It involves the prosthetic replacement of all femoro-tibial and/or femoro-patellar compartments. It represents an increasingly common therapeutic solution for patients suffering from gonarthrosis, rheumatoid arthritis, or other degenerative knee pathologies. TKA aims to alleviate pain, correct mechanical defects, improve joint function, and enhance patient's quality of life [1].

TKA has seen a continuous increase over several decades: +148% in the United States (2000-2014) and +210% in Sweden (1995-2015) [2]. This upward reflects a global expansion trend driven by population aging, increased demand from a more active population, and advancements in surgical techniques.

This article aims to analyze the epidemiological and statistical data concerning TKAs performed in our institution. By exploring patient's demographic characteristics, primary indications for surgery, and the various sizes used, our goal is to make a significant contribution to the existing literature and provide valuable insights to enhance the management of patients requiring TKA.

Materials and Methods

We conducted over 8 years, from January 2016 to December 2023, a mono-centric retrospective study with a descriptive aim on 789 total knee arthroplasties at the two orthopedic and trauma surgery departments of the Mohammed V Military Training Hospital (HMIMV) in Rabat, Morocco.

All patients who underwent TKA, TKA with extension stem, or hinge TKA, regardless of the

indication, and whose medical records were complete or usable, were included in the study. Incomplete or unusable records were excluded.

The prostheses used were all cemented tri-compartmental, posterior-stabilized with mobile bearing designs. We utilized two brands of prostheses: Zimmer[®] and Implant Cast[®]. The chemical compositions of the materials differed between the two brands. For the femorotibial implants, Zimmer[®] employed a titanium alloy, while Implant Cast[®] used a chrome-cobalt alloy. In both brands, the insert was made of cross-linked vitamin E Polyethylene (PE).

Femoral implants from both brands were available for both right and left sides, with five different sizes: Zimmer[®] (C, D, E, F, G) and Implant Cast[®] (2, 2.5, 3, 4, 5). Tibial implants were offered in six sizes for both brands, ranging from Tibia 2 to Tibia 7 for Zimmer[®] and from Tibia 2 to Tibia 6 for Implant Cast[®]. For PE inserts, Zimmer[®] offered 25 available sizes, while Implant Cast[®] offered 16.

Data collection was conducted within the medical device department of the HMIMV. Data were collected using a collection form created in Excel. This form was completed based on information contained in traceability records, prosthesis traceability registers, and material request forms sent by the orthopedic trauma services to the pharmacy department's medical device service.

The variables studied included sociodemographic characteristics, clinical data, and sizes used in the different implants. Sociodemographic characteristics included age, gender, and health insurance status. Clinical data included the operated side and operative indication.

Results

The average age was 67 ± 7.5 years with a range from 44 to 101 years. The main age group was 60 to 70 years, accounting for nearly two-thirds of the operated patients, followed by the 70 to 80 years age group, representing just over 20% of the total patients (Figure 1).

The number of TKAs performed at the Traumatology-Orthopedics Department of HMIMV has not been stable in recent years, with a peak of 142 TKAs performed in 2019 (Figure 2). Between 2016 and the beginning of 2021, the prostheses used were from the Zimmer[®] brand. From late 2021 to 2023, the prostheses used were from the Implant Cast[®] brand.

Out of the 789 cases analyzed, 553 were female (70%) and 273 were male (30%), resulting in a sex ratio of 0.4. In our study, 654 out of the 789 operated patients, accounting for 83%, were members of the Royal Armed Forces mutual insurance.

The right side was affected in 51.4% (406 TKAs) of cases, while the

left side was affected in 48.6% (378 TKAs) of cases. All our patients underwent surgery for primary gonarthrosis in 679 cases, accounting for 86%, and for secondary causes (post-traumatic, inflammatory conditions) in 110 cases, accounting for 14%. Patellar resurfacing was performed in 44 cases, representing 5.57%.

Among the 789 total knee arthroplasties, 11 cases, representing 1.3%, were performed with an extension stem, 4 cases, representing 0.5%, were hinge TKAs, and 12 cases, representing 1.5%, were revision surgeries for PE insert due to prosthetic joint infection.

Figures 3 and 4 display the number of femoral and tibial implants from the Zimmer[®] brand used, categorized by patient's genders. Femoral implants of sizes D and E are predominantly used in females, whereas sizes F and G are predominant in males. For tibial implants, size 3 is most common among females, while size 5 is most common among males.

For the Implant Cast[®] brand, femoral implants of sizes 3 and 2.5 are mainly used in females, while sizes 4 and 5 are distinguished among males (Figure 5). Regarding tibial implants, size 3.5 is most common among females, while size 5 is most common among males (Figure 6).

The most commonly used thickness in PE is 9 mm for Zimmer[®] (Table 1) and 10 mm for Implant Cast[®] (Table 2).

Discussion

The average age of the patients was 67 years with a variation of ± 7.5 years, ranging from 44 to 101 years. This result is similar to that observed by El Abdi [3], where the average age was 67.8 years with a range from 49 to 84 years. However, Benchekroun [1] reported an average age of 58 years, ranging from 35 to 84 years, while Mathieu le Stum [2] found an average age of 70.7 years. The number of Total Knee Arthroplasties (TKAs) performed in 2020 and 2021 decreased by about half compared to previous years. This decrease is also mentioned by Abdelal [4] with a reduction rate of 20%. This decrease is attributed to the consequences of the COVID-19 pandemic. The slight decreases in the number of TKAs observed in 2017, 2018, and 2023 can be explained by the departure of two experienced surgeons from our institution. The sex ratio was 0.4. This result is consistent with those of Benchekroun [1], Mathieu Le Stum [2], and El Abdi [3], who found a female predominance with respective percentages of 72%, 63.3%, and 61%. The vast majority of patients operated on in our institution are members of the Royal Armed Forces mutual insurance. This situation is entirely coherent, given that our hospital is a Military institution.

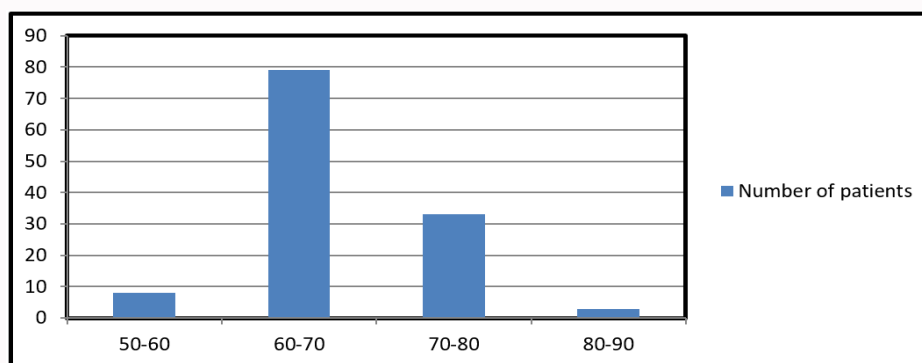


Figure 1: Distribution of patients by age.

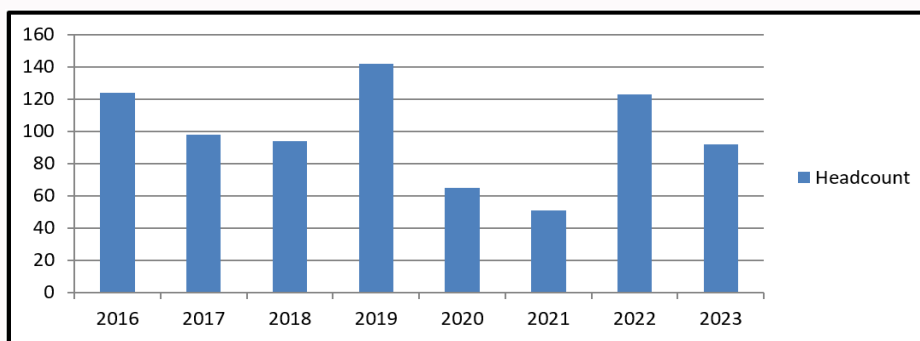


Figure 2: Distribution of the number of TKAs by years.

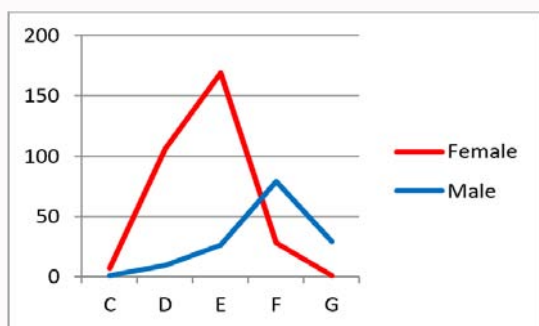


Figure 3: Distribution of femoral implant sizes of Zimmer° according to gender.

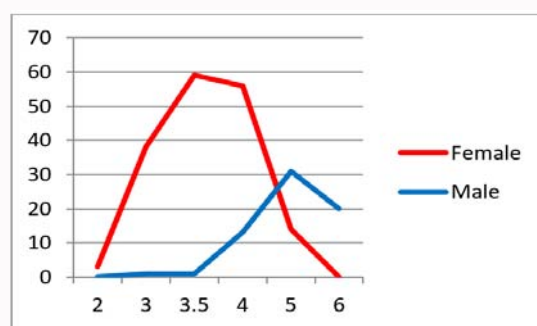


Figure 6: Distribution of tibial implant sizes of Implant Cast° according to gender.

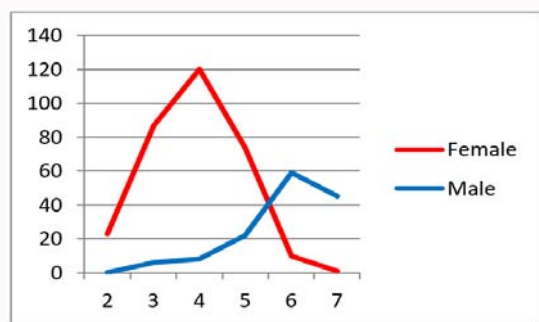


Figure 4: Distribution of tibial implant sizes of Zimmer° according to gender.

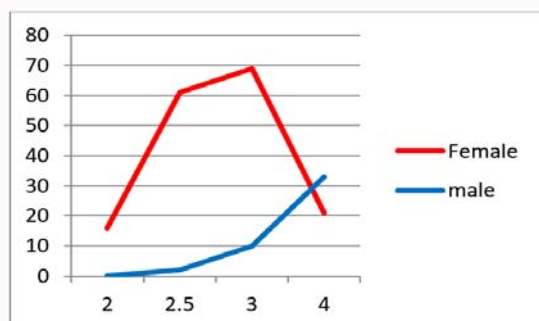


Figure 5: Distribution of femoral implant sizes of Implant Cast° according to gender.

The predominant side in both sexes was the right side at 51.4% compared to 48.6% for the left side. These results are comparable to those of El Abdi [3], who found 60% for the right side and 40% for the left side. However, Benchekroun [1] found a predominance of the left

Table 1: Distribution of Zimmer° PE thickness according to the number of patients.

Thickness of the PE in mm	Number of patients
9	296
10	189
12	58
14	9
17	1

Table 2: Distribution of Implant Cast° PE thickness according to the number of patients.

Thickness of the PE in mm	Number of patients
10	172
12.5	56
5	8

side with a percentage of 63%. Thus, the authors could not determine the role of the affected side in the evolution of knee arthropathies. The predominant operative indication was primary gonarthrosis in 86%, whereas arthritis was secondary in 14% of cases. These results are comparable to those of Benchekroun [1], who also found primary gonarthrosis as the main indication with a percentage of 85%.

The revision of PE due to prosthetic joint infection is around 1.5%, which is consistent with the findings of Quentin [5], who estimated the incidence of joint prosthesis infection to be between 0.5 and 2%.

Femoral implants vary in size depending on the patient's gender, with smaller implants used in females and larger implants in males. This is confirmed by Hong-Chul [6], who examined the morphology of the distal femur and proximal tibia and found that Korean women

had smaller dimensions than Korean men. Similarly, the results of Tw [7] revealed that the average anteroposterior length of the distal femur was 59.14 mm for female patients, whereas it was 64.55 mm for males. Moreover, the average mediolateral width was 63.83 mm for women and 72.45 mm for men. Wei-Pin [8] also asserts that men have larger femurs than women.

Tibial implants of size 3 are frequently implanted in women, which is in accordance with the findings of Bo [9] and Hong-Chul [6]. This research revealed significant differences between the sexes regarding the mediolateral, average anteroposterior, medial anteroposterior, and lateral anteroposterior dimensions of the resected proximal tibias.

The most used PE thickness is 9 mm. These results are similar to those found by Ameline [10]. Our surgeons adopt good practice by using reduced thickness inserts. Dhong-Won [11], Rajamäki [12], and Pijls [13] recommend choosing inserts less than 12 mm thick, as beyond this value, the risk of revision of the primary TKA increases.

Conclusion

In conclusion, this retrospective study on TKA performed at the Mohammed V Training Hospital in Rabat highlights several significant trends and provides valuable insights for the future management of patients suffering from degenerative knee pathologies. The results show that TKA is mainly performed among women, with a predominance of patients aged 60 to 70 years, thus reflecting the typical profile of patients requiring this intervention. Primary gonarthrosis remains the main indication for TKA, highlighting the need for this intervention to improve the quality of life of patients.

This study contributes to the existing literature by providing detailed epidemiological and clinical data on TKA in a Moroccan context. She also emphasizes the importance of traceability and management of medical devices to optimize surgical results.

Finally, this study encourages increased collaboration between the various departments of the hospital and the manufacturers of prostheses to ensure optimal selection of implants and rigorous monitoring of patients, thus contributing to the continuous improvement of orthopedic care.

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