ORTHOPAEDICS

TKA SAGITTAL POSITION OF THE FEMORAL COMPONENT & PATIENT SATISFACTION
A New Parameter

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ABSTRACT • Purpose : Patient dissatisfaction after total knee arthroplasty (TKA) is not uncommon; even when a surgery is rated very successful from the surgeon eye. This mismatch between surgeon and patient satisfaction might be reduced with more evidence-based endpoints to reach by the surgeon, when performing TKA. We hypothesized the presence of a relationship between patient satisfaction and the position in the sagittal plane of the femoral component.

Material and method : This is a retrospective study of 60 TKA from an initial series of 100 patients. Our inclusion criteria were : a true lateral postoperative X-ray of the TKA showing 10 cm of the distal diaphysis; and filled Oxford Knee Score questionnaire (OKS) with 14 months of minimum follow-up.

Results : We found three types of sagittal plane position of the femoral components: • Type A or neutral: 31TKA (52%) • Type B or in extension: 23 TKA (38%) • Type C or in flexion: 6 TKA (10%). The Oxford Knee Score in our series was: in type A (neutral): 78.2%, type B (extension): 75.1%, type C (flexion): 68.4%.

Conclusion : This study shows that a neutral position of the femoral component in the sagittal plane gives the highest patient satisfaction according to OKS, with a better outcome for extension position when compared to flexion position.

Keywords : total knee arthroplasty, sagittal position of the femoral component; flexion of femoral component; extension of femoral component; patient reported outcome; patient satisfaction after total knee arthroplasty

Abdallah AC, Caton J, Ayche MA, Abboud JE, Wakim GY, Chamseddine AH. Corrélation de la satisfaction des patients avec la position sagittale de la composante fémorale après prothèse totale du genou. Un nouveau paramètre. J Med Liban 2018 ; 66 (4) : 188-192.

RÉSUMÉ • But de l'étude: Le "genou oublié" après prothèse totale du genou (PTG) reste un but difficile à atteindre, car plusieurs patients considérés comme ayant un résultat optimal du point de vue du chirurgien restent insatisfaits. Cette discordance entre la satisfaction de certains patients après PTG et celle du chirurgien pourrait être réduite en affinant ou bien même en ajoutant des objectifs supplémentaires à cette seule procédure chirurgicale.

Matériel et méthode : Pour cela nous avons réalisé une étude rétrospective sur 60 PTG extraites d'une série continue de 100 patients. Nos critères d'inclusion ont été : une radiographie postopératoire en position latérale stricte après PTG visualisant les deux condyles bien superposés en arrière, et 10 cm de la diaphyse distale du fémur bien visible; un score d'Oxford (*Oxford Knee Score:* OKS) avec un questionnaire adéquatement rempli et un suivi minimum de 14 mois.

Résultats : Nous avons trouvé 3 types de positions possibles de la composante fémorale dans le plan sagittal de la composante fémorale: • Type A en position neutre (31 PTG; 52%) • Type B en extension (23 PTG; 38%) • Type C en flexion (6 PTG; 10%). Le score OKS dans notre série était de 78,2% pour le type A, 75,1% pour le type B et de 68,4% pour le type C.

Conclusion : Cette étude démontre que la position neutre de la composante fémorale dans le plan sagittal après PTG entraîne le taux de satisfaction le plus élevé selon le score OKS, avec un meilleur taux de satisfaction pour la positon en extension versus celle en flexion.

Mots-Clés : prothèse totale du genou; position sagittale de la composante fémorale; flexion de la composante fémorale; extension de la composante fémorale; évaluation des résultats par le patient; satisfaction du patient après prothèse totale du genou

INTRODUCTION

Total knee arthroplasty (TKA), which is the gold standard for the management of end-stage knee arthritis, is a very successful procedure [1].

However, 15 to 30% of patients remain dissatisfied after this surgery [2,3]. Between those dissatisfied patients, many fulfill surgeon expectations in term of postoperative radiographic control, range of motion (ROM) and stability, but do not reach patient expectations in term of complete pain relief, normal knee function and normal quality of life. This aforementioned mismatch between surgeon and patient satisfaction means that patient satisfaction goes beyond surgeon satisfaction [4,5]. In another term, surgeons need to refine their targets or to add new targets when performing total knee arthroplasty.

We noticed on the true postoperative lateral view of TKA three types of relationships between the posterior

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femoral cortex and the posterior femoral cut. Those relationships will define the sagittal position of the femoral component (SPFC) in neutral, extension or flexion.

We hypothesized that the sagittal position of the femoral component will affect patient satisfaction and patient-reported outcome (PRO) after TKA. Currently in the literature we have many validated scores for the measurement of patient satisfaction after TKA. The most commonly used are the new Oxford Knee Score (OKS), the New Knee Society Score (NKSS), the Osteoarthritis Outcome Score (OOS) and the Western Ontario and McMaster University osteoarthritis index (WOMAC) [6,7].

We choose to measure patient satisfaction after TKA with the OKS and to find a possible correlation between this aforementioned patient satisfaction and the sagittal position of the femoral component.

MATERIAL AND METHODS

Following approval by our institutional Review Board, this retrospective study was performed on 100 patients randomly pulled from the records of one surgeon. All patients where operated in the same facility with the same implant; a tricompartimental posterior stabilized mobile bearing prosthesis (Endurance; Lepine Group, Genay, France). The surgeon had nine years of experience after a fellowship training at the time of the first case incorporated in this study.

All patients were operated between February 2013 and January 2017 with a minimum follow-up of 14 months.

The new Oxford Knee Score (new OKS) was used to assess patient satisfaction [8]. The OKS was primarily used to assess outcomes of total knee replacement (TKR) surgery. It is a 12-item patient-reported outcome (PRO) specifically designed and developed to assess function and pain after TKR surgery. It is short, reproducible, valid and sensitive to clinically important changes.

The Oxford Knee Score has recently been adopted by the UK Department of Health (DoH) for the assessment of knee operations, which are carried out each year in National Health Service (NHS) hospitals. The OKS is part of the nationwide Patient Reported Outcome Measure program launched by the UK DoH in April 2016 [9,10].

The radiographic assessment was based on the true lateral knee postoperative X-ray; a mandatory inclusion criteria is a superimposition of the medial and lateral condyles of the distal femur with a minimum of 10 cm of the distal diaphysis of the femur visualized on the X-ray.

We found three possible positions of the femoral component in the sagittal plane: neutral, extension or flexion. This was assessed according to the following method.

We draw a first line parallel to the posterior femoral cortex and a second line parallel to the posterior femoral cut and we define three types, A, B and C (Figure 1).

In Type A: the two lines are parallel and the femoral component is in a neutral position in the sagittal plane.

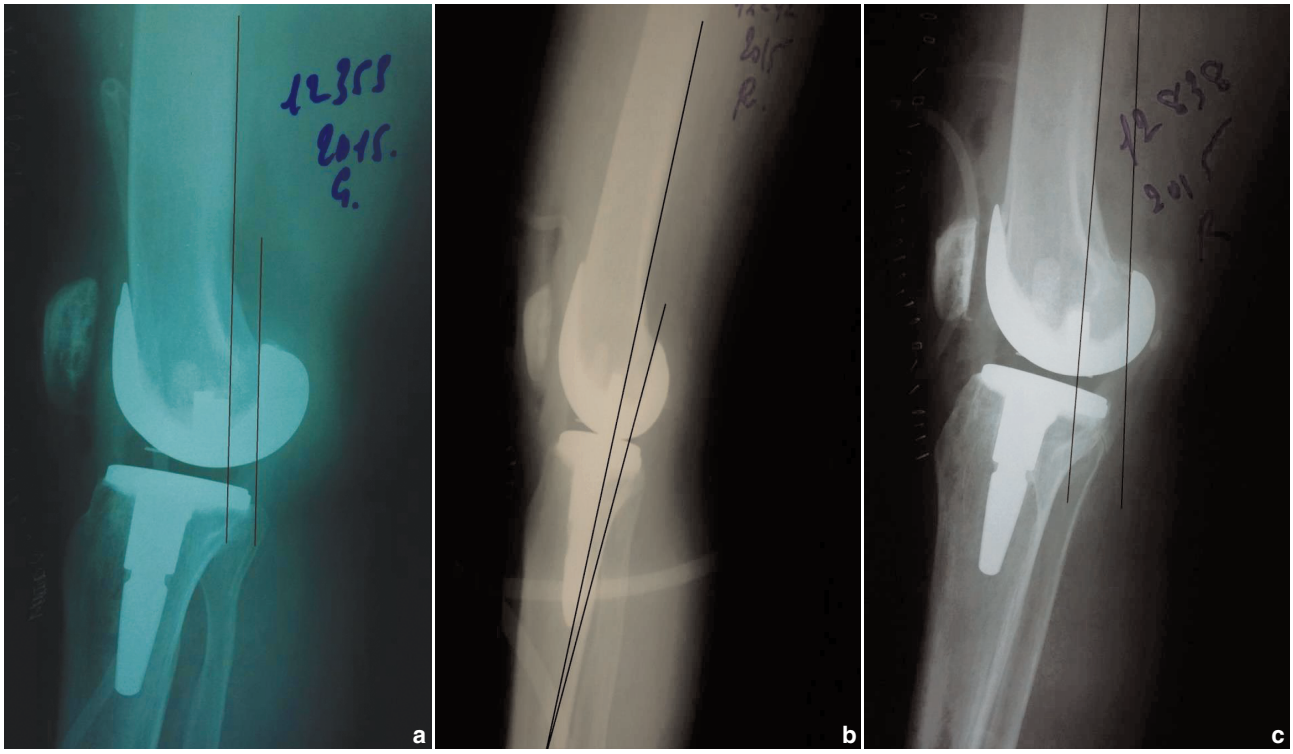

Figure 1. Sagittal position of the femoral component in total knee arthroplasty: neutral (a), extension (b), flexion (c)

In Type B: the two lines are convergent distally and the femoral component is in an extension position in the sagittal plane. In Type C: the two lines are divergent distally and the femoral component is in flexion in the sagittal plane.

All patients were contacted by telephone by two senior residents in order to fill the Oxford Knee Score questionnaire [11]. If after repeated attempts to obtain complete data from an individual, only one or two questions had been left unanswered, the mean value representing all of their other responses was used to fill the gaps. An alternative computerized method of imputing values has been reported by Jenkinson *et al*. (2006). If more than two questions were unanswered the overall score was not calculated [12].

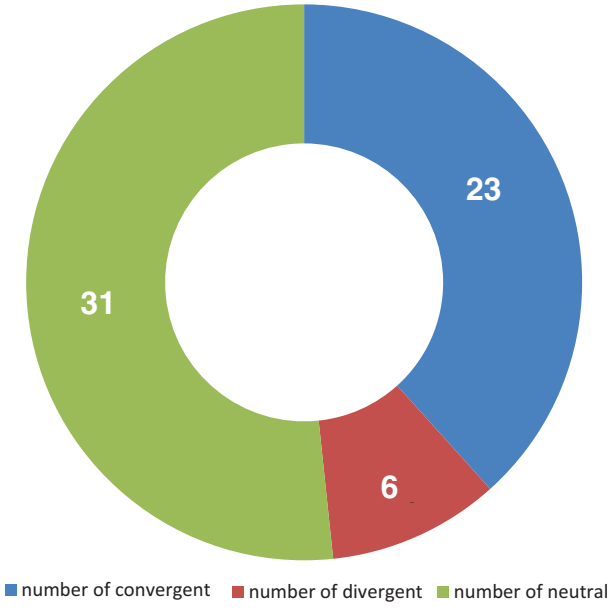

Figure 2. Number of geometric types

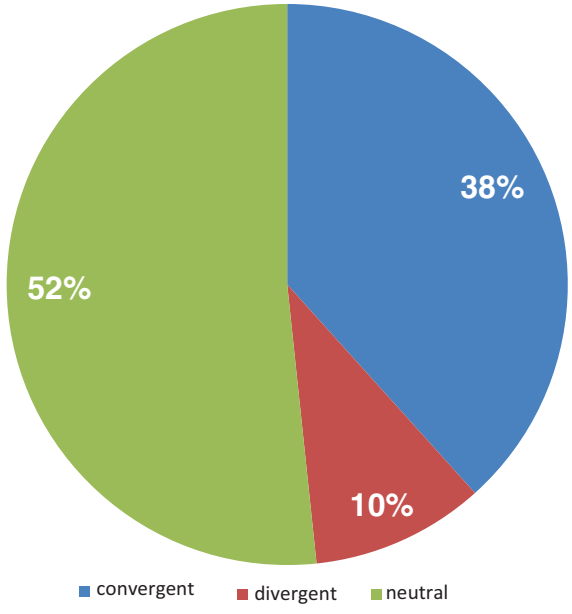

Figure 3. Percentage of geometric types

Our inclusion criteria were: the aforementioned method for data collection according to OKS, and strict lateral postoperative knee X-ray. We retained for this study 42 patients for a total number of 60 knees with 18 bilateral total knees and 24 unilateral TKA. The gender repartition was 34 females (11 left, 6 right, 17 bilateral for a total of 51 female knees), and 8 males (1 left, 6 right and 1 bilateral for a total of 9 male knees).

The mean age was 69.75 years (67.75 years for male and 69.97 years for female patients) with a minimum age of 46 years and a maximum age of 85 years.

Statistical analysis

A specialist in biostatistics conducted the statistical work according to Student's test.

The statistical significance in rate difference between those three categories was evaluated according to the t-table, with critical *p*-value 5% and degree of freedom (df) = -2 [13].

RESULTS

As previously mentioned a total of 60 knees fit our inclusion criteria; 31TKA (52%) type A (neutral), 23 TKA (38%) type B (extension: distally convergent), 6 TKA (10%) type C (flexion: distally divergent). Figures 2,3.

The OKS in our series were: type A (neutral): 78.2%, type B (extension): 75.1%, type C (flexion): 68.4%. Figure 4.

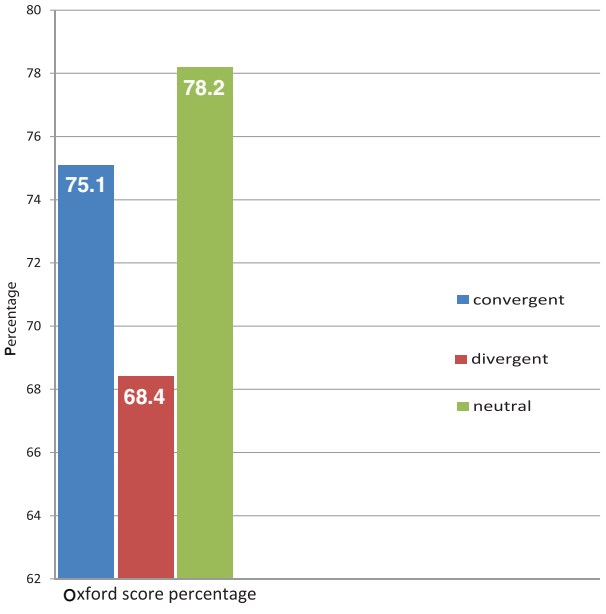

Figure 4. Oxford score results in our serie

According to the t-test we made the comparison between each two types and found the following results:

Extension-neutral: t was equal to 2.079 and $p = 0.02292$ (< 0.05), meaning a statistically significant difference between the two types with higher significance to neutral geometry.

Flexion-neutral: t was equal to 2.776 and $p = 0.0071$ (< 0.05), meaning a statistically significant difference between the two types with higher significance to neutral geometry.

Extension-flexion: t was equal to 2.776 and $p = 0.0229$ (< 0.05), meaning a statistically significant difference between the two types with higher significance to extension geometry.

DISCUSSION

Patient dissatisfaction after total knee arthroplasty is multifactorial. Some factors are patient-related, ranging from patient expectations to medical and psychiatric comorbidities. Other factors are related to the surgical procedure, ranging from the anesthesia to the surgical technique per se, the choice of implant as well as the postoperative management [14-16].

In this study our aim was to find a correlation between the sagittal position of the femoral component after TKA and patient satisfaction, considering all other factors beyond our discussion.

To our knowledge this aforementioned correlation has not been mentioned before in the literature. Unexpected findings were sometimes observed in the sagittal plane positioning of TKA such as oversize of femoral component, or anterior notching of anterior femoral cortex [17]. For Matzolis *et al*. an increased flexion of the femoral component leads to a reduction of the flexion gap and thus potentially to limited mobility in the measured resection technique [18]. According to Faris *et al*. in a series of 623 patients, no correlation between the sagittal plane position of the femoral component and the final knee range of motion could be found when component position was between 20° flexion and 20° of extension [19].

Reference lines and angles (RLA) of femur in the sagittal plane which characterize its physiological sagittal bowing mutual relations of the mid-diaphyseal lines of the proximal, middle and distal thirds of femur were studied. The angle between the mid-diaphyseal lines is 10° at the level of the proximal third, 16° at the level of the middle third, 7° at the level of the distal third [20,21]. It has been documented that the mechanical alignment of the limb in both coronal and sagittal axes should be preserved in TKA because sagittal femoral bowing (SFB) can significantly increase the flexion alignment of the femoral component [22].

In our series the surgeon used the gap technique that will affect the rotation of the femoral component in the frontal plane (external, neutral, internal or internal rotation) as well as in the sagittal plane (neutral, extension or flexion). This step is preceded by the tibial cut, which is performed using an intramedullary as well as an extramedullary cutting jig designed to give an orthogonal cut to the mechanical axis of the tibia with no posterior slope (the slope is built in the polyethylene (PE) insert).

A statistically significant superior outcome associated to parallel posterior femoral and patellar cuts in the sagittal plane has been previously demonstrated according to/in accordance with the OKS [23].

The present study demonstrates that a neutral position of the femoral component in the sagittal plane in respect to the distal femoral posterior line gives us an overall statistically significant higher patient satisfaction according to the OKS than extension and flexion positions, with a higher outcome for the extension position when compared to the flexion position.

A limitation factor of our study might be the number of cases (60 TKA) retained in our series; however, for the first time in the literature, we are documenting with an evidence-based methodology this presumed correlation between a neutral position of the femoral component of TKA and patient satisfaction.

CONCLUSION

This study demonstrates that a neutral position of the femoral component in TKA in respect to the posterior cortical line of the distal femoral diaphysis gives the highest patient satisfaction rate according to the OKS, with a higher outcome to the extension position when compared to the flexion position.

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