



Total Knee Arthroplasty in Younger Patients Evaluated by Alternative Outcome Measures

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ABSTRACT

In this prospective multicenter study we included subjects younger than 60 years of age and scheduled for primary total knee arthroplasty (TKA). The study assessed patients' overall satisfaction, fulfillment of preoperative expectations, the effect on socioeconomic parameters, and quality of sexual life. Questionnaires including Oxford Knee Score (OKS) and SF-36 were evaluated preoperatively and 3, 6, and 12 months postoperatively. OKS and SF-36 showed significant improvements. However, patient satisfaction and fulfillment of personal expectations did not reflect these scores. Overall, TKA did not affect the patients' socioeconomic status, and overall, patients did not experience impairment of sexual life, but decreased frequency and negative affection of sexual practice should be anticipated. Alternative outcome measurements of TKA surgery not focusing on implants and surgical techniques shed new light on important consequences of arthroplasty surgery.

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Total knee arthroplasty (TKA) is the gold standard of end stage knee osteoarthritis (OA) treatment. In western Europe and North America the prevalence of OA is estimated to increase about 40% from 2005 to 2030 [1–3] due to demographic factors. Knee arthroplasty surgery is expected to increase by as much as 673% from 2005 to 2030. In recent decades the TKA incidence in younger patients—less than 60 years of age—have been increasing, and will continue to increase [4–6]. Expectations regarding knee arthroplasty surgery of younger patients are expected to differ importantly from older patients.

TKA is well accepted as a reliable surgical procedure to relieve pain and return patients with severe OA to near-normal function [7–13]. The literature primarily has focused on implant survival, engineering and metallurgic aspects, complication rates, surgical techniques and range of motion (ROM). However, the patient's own perception of the end result differs greatly from the surgeon's technical evaluation of the end result [14–16], and Patient-Reported Outcome Measures (PROMs) are increasingly recognized as a new important set of core values concerning knee arthroplasty surgery. Eight to 19% of patients are actually dissatisfied with the outcome of TKA regardless of the purely "technical" result [8,17,18]. Dissatisfaction with the outcome is

correlated with preoperative expectations not being fulfilled [19,20]. Fulfillment of preoperative expectations ranges from almost 100% satisfaction regarding knee pain alleviation to only about 20% satisfaction concerning the ability to participate in sports and leisure activities [10]. It seems that many aspects of the patient perceived success of the end result and actual outcome estimates are still to be understood. Some studies have focused on health-related quality of life (HRQoL) and alternative outcomes, such as the effect on personal welfare and quality of sex life after TKA [7,8,10,12,13,21–29]. However, only few studies have focused on these outcomes in a younger patient population, although these outcomes are of crucial importance during the everyday life of young patients [30,31]. The utilization of alternative outcome measures in the evaluation of outcome after TKA in young adults seems warranted to better understand the patients' perception of successful treatment.

Due to the lack of focus in contemporary literature on patient-related aspects of outcome measurement in younger TKA patients our aim was prospectively to evaluate the overall patient satisfaction, fulfillment of expectations, symptoms of depression and the effect on socioeconomic status and quality of sexual life using PROMs.

Material and Methods

The study was conducted as a prospective multicenter cohort study at three arthroplasty centers in the Copenhagen area, Denmark (blinded). Consecutive patients less than 60 years of age scheduled for unilateral or bilateral primary TKA from April 2010 to May 2011

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were eligible for inclusion ($n = 136$ patients, 121 unilateral TKA/15 bilateral simultaneous TKA). Patients were excluded if they did not consented ($n = 7$), if they were unable to understand and fill in the questionnaires ($n = 12$), if they did not return the preoperative questionnaire prior to surgery ($n = 2$), if they suffered from cognitive dysfunction ($n = 0$), or if they suffered from malignant diseases ($n = 0$). Consequently, the study population consisted of 115 patients; 103 scheduled for unilateral TKA and 12 scheduled for bilateral simultaneous TKA. Patient demographics and clinical history are presented in Table 1. Bilateral knee arthroplasties were performed at only one center, and patients received the same type of prosthesis on both sides. All patients were operated on with a standard anterior midline incision. The type of prosthesis used was dictated by the preference of the surgeon. The following prostheses were used: cruciate retaining, fixed bearing in 71 patients (AGC Biomet, PFC DePuySynthes, Triathlon Stryker), cruciate retaining, rotating platform in 39 patients (PFC-Sigma DePuySynthes, Vanguard ROCC Biomet, NextGen Zimmer), and posterior stabilized, fixed bearing in 5 patients (LPS-Flex Zimmer). In one case of a cruciate-retaining, fixed-bearing TKA, a stemmed tibia component was implanted due to an intra-operative fracture.

The study was reported to the National Data Protection Agency and according to local legislation-specific ethics committee approval was not needed for this prospective questionnaire-based study. Prior to inclusion the study was reported to Clinicaltrials.gov (No. NCT01305759).

The study group received questionnaires 1 month before scheduled surgery, and at 3, 6, and 12 months after surgery. If the patient did not return one of the postoperative questionnaires within 3 weeks of deadline, a reminder was mailed to the patient. If the questionnaire was still not returned within another 2 weeks, the patient was contacted by phone and encouraged to participate. If the patient still did not return the questionnaire, the patient was not reminded again, but was still scheduled to receive a questionnaire at the next follow-up. The overall response rates for return of questionnaires varied between 68% and 84% (Fig. 1). Patients who sustained a complication were also included in the analysis.

Table 1
Demographic Data and Clinical History for the Study Population.

Age at time of surgery	
Median (interquartile range)	54 (49–57) years
Sex	
No. of females/males	61/54
Relation to work	
No. of employed	78
No. of unemployed	27
No. of early age retired	10
Gross annual income in US dollars ($n = 114$)	
<35,000	28
35,000–61,000	45
61,000–88,000	30
>88,000	11
Social class ($n = 113$)	
Unskilled worker	20
Skilled worker	27
Salaried or white collar	23
Mid-level manager or 3–4 years of higher education	29
Manager or highly educated (holding at least a graduate degree)	14
Previous arthroplasty in another joint	
Contralateral knee	15
Hip	2
Another joint	1
Arthritis or severe discomfort in another or multiple joints	
Contralateral knee	20
Hip	3
Another joint	18
In 2 or more joints	8

Questionnaires

Preoperative and postoperative batteries consisted of Oxford Knee Score (OKS), Short Form-36 version 1 (SF-36), The Major (ICD-10) Depression inventory (MDI), a self-developed and validated questionnaire concerning socioeconomic aspects, and a self-developed and validated questionnaire concerning the patients' sex life. Preoperative questionnaires additionally dealt with functional category (1 = unilateral knee disease, 2 = bilateral knee disease, and 3 = multiple joint disease) and information regarding earlier arthroplasty surgery in other joints. The postoperative questionnaires summarized information concerning postoperative physiotherapy. The 12-month questionnaire covered the patients' satisfaction and fulfillment of expectations on two 5-level Likert scales, running from 1) very satisfied, 2) satisfied, 3) neutral, 4) dissatisfied, and 5) very dissatisfied and from 1) all my expectations are fulfilled, 2) most of my expectations are fulfilled, 3) to some extent my expectations are fulfilled, 4) few of my expectations are fulfilled, and 5) none of my expectations are fulfilled. Willingness to repeat surgery if necessary was also reported.

The Oxford Knee Score (OKS)

The OKS has undergone thorough reliability and validity assessments [23,32–34]. The score consist of 12 items regarding daily activities, and each item is scored on a five-level Likert scale 0 (greatest disability) to 4 (no disability), resulting in a score from 0 to 48, with 48 being the best possible score [34].

Short Form-36

The SF-36 is an instrument that has been used since the early 1990s to assess HRQoL [35,36]. It consists of 36 items and evaluates 8 different domains; Physical functioning (PF), Social functioning (SF), Role-Physical (RP), Bodily Pain (BP), Mental Health (MH), Role-Emotional (RE), Vitality (VT), and General Health (GH). The theoretical scoring scales for all eight-item scores run from 0 to 100 with 100 being the best possible score. The eight-item scores can be transformed into two summary scores; the physical component summary (PCS) and mental component summary (MCS). Both PCS and MCS contain information from all eight-item scores. The advantage of PCS and MCS is a smaller confidence interval and elimination of both floor and ceiling effect [37]. PCS and MCS were compared with a group from the population similar with respect to age and sex [38,39].

The Major (ICD-10) Depression Inventory

The Major (ICD-10) Depression inventory (MDI), contains 10 items. However, items 8 and 10 are divided into two sub-categories (A and B), where only the highest score (A or B) are included in the final analysis. Each item represents a symptom, and is scored on a six-level Likert scale, measuring how much of the time the symptom has been present over the last 14 days; zero (the symptom has not been present at all) to five (the symptom has been present all of the time). The resulting score is in the interval 0 to 50, where a score ≥ 20 represents depression. The MDI has demonstrated a high specificity and sensitivity as a screening tool in a somatic patient group [40,41].

Questionnaire concerning socioeconomic outcome

Due to the unique labor and welfare models in different parts of the world no existing questionnaires met our requirements and therefore we developed our own questionnaire. To validate the content of the questionnaire, a semi-structured interview was conducted including 20 members of the staff comparable to TKA

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