

A 5 year prospective study of patient-relevant outcomes after total knee replacement

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Summary

Objective: To prospectively describe self-reported outcomes up to 5 years after total knee replacement (TKR) in Osteoarthritis (OA) and to study which patient-relevant factors may predict outcomes for pain and physical function (PF).

Methods: 102 consecutive patients with knee OA, 63 women and 39 men, mean age 71 (51–86) assigned for TKR at the Department of Orthopaedics at Lund University Hospital were included in the study. The self-administered questionnaires Knee injury and Osteoarthritis Outcome Score (KOOS) and SF-36 were mailed preoperatively and 6 months, 12 months and at 5 years postoperatively.

Results: Response rate at 5 years was 86%. At 6 months significant improvement was seen in all KOOS and SF-36 scores ($P < 0.001$). The percentage of patients performing more demanding functions related to sports and recreation increased postoperatively. The best postoperative result was reported at the 1 year follow-up. Compared to the 1 year follow-up, a significant ($P \leq 0.01$) decline was seen at 5 years in the KOOS subscale activity of daily living (ADL) function (82–73) and the SF-36 subscale bodily pain (72–63), PF (61–51) and vitality (69–59). Patients who scored in the lowest quartile preoperatively in the KOOS subscales pain and ADL made the greatest improvements to 1 year (18–82, 22–80) but also declined the most from 12 months to 5 years (82–72, 80–66). Being 10 years older pre-operatively predicted 5–7 points worse scores in KOOS pain and KOOS symptoms at 1 and 5 years. When adjusted for age, sex and comorbid conditions, pre-operative SF-36 scores did not predict postoperative KOOS pain or PF scores.

Conclusion: Compared to preoperatively, a significant improvement was still seen 5 years postoperatively. However, the best result was reported at 1 year, indicating a decline from 1 to 5 years after TKR. To fully evaluate the results of TKR with regard to pain and PF, follow-ups longer than 2 years are needed, and items of more demanding PFs should be included. Older age to some extent predicted more postoperative pain and other symptoms, however, no predictors of postoperative PF were found, indicating the difficulty of determining preoperatively who will benefit more or less from the procedure.

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Key words: TKR, OA, Outcome, Pain, Physical function.

Introduction

Knee osteoarthritis (OA) is a well known cause of pain and functional disability in the elderly. In patients suffering from severe OA total knee replacement (TKR) is the most effective treatment¹ and offers the patients pain relief and improved physical function (PF)^{2,3}. Numerous follow-up studies after TKR have been performed during the last decade, most of which have a follow-up time of 1–2 years^{3,4}. The knowledge about the longer term results from the patients' perspective is limited.

The optimal circumstances for performing total joint replacement is not known. It has been suggested that younger patients have a better outcome after total hip replacement⁵ and that subjects with less preoperative pain and functional limitations have a better postoperative outcome after TKR³. On the other hand, younger patients with less severe symptoms may also benefit from

non-surgical treatments which in turn are associated with less risk than surgical treatment. It is thus of interest to study if patient characteristics such as age, gender, comorbidities as well as preoperative pain and function may predict the postoperative outcome.

Considering the increasing demands on PF from the graying population⁶, it is important to evaluate demanding physical activities for the population with severe OA who are assigned for TKR⁷. Commonly used instruments for predicting outcomes for OA and total joint arthroplasty, such as the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the Oxford-12, evaluate PFs required for daily living only, while other methods, such as the Knee injury and Osteoarthritis Outcome Score (KOOS), also evaluate PFs required for sports and recreational activities. In this study KOOS pain and activity of daily living (ADL) are chosen as primary outcomes since pain is the primary indication for TKR and improving PF is the secondary objective of the procedure. As predictors of outcome we have chosen preoperative age, gender, Body mass index (BMI), comorbid conditions and the SF-36 subscales: PF, bodily pain (BP) and mental health (MH) since these predictors have been shown to influence the outcome after total hip replacement⁵ as well as after TKR^{3,8,9}. This study adds

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knowledge to whether the same predictors are relevant also at longer follow-ups.

The aims of this prospective study were (1) to describe the outcome (from the patient's perspective) up to 5 years after TKR in subjects with knee OA, (2) to evaluate the extent to which patients having TKR performed physical activities related to sports and recreation functions, (3) to identify preoperative characteristics predicting the postoperative outcome.

Methods

PATIENTS

125 consecutive patients who were on the waiting list for primary TKR at the Department of Orthopedics at Lund University Hospital, Sweden received questionnaires by mail. Patients were recruited from December 1999 to April 2001. Of these 125 patients, 23 were excluded, 13 underwent other operative procedures, eight were not operated on during the study period and two had rheumatoid arthritis. Thus preoperative data was available from 102 patients with knee OA, 63 women and 39 men. Mean age was 71 years (51–86).

QUESTIONNAIRES

All questionnaires were mailed to the patients and returned by mail in pre-paid envelopes. In addition to the KOOS, patients were also sent the SF-36 and questions regarding background data. The patients received questionnaires on four occasions: preoperatively, and postoperatively after 6 months, 12 months and 5 years.

KOOS

The KOOS is an extension of the WOMAC¹⁰. KOOS was developed and is validated for several cohorts of younger and/or more active patients with knee injury and/or OA¹¹. KOOS is a 42 item self-administered, self-explanatory questionnaire that covers five patient-relevant dimensions: pain, other disease specific symptoms, ADL function, sport and recreation function (Sport/Rec), and knee-related quality of life. The WOMAC pain questions are included in the subscale pain, the WOMAC stiffness questions are included in the subscale other disease specific symptoms and the WOMAC subscale function is equivalent to the KOOS subscale ADL. In comparison to WOMAC the KOOS is advantageous when assessing groups with high expectations of physical activity and when assessing long-term outcomes¹².

SF-36

The SF-36 is a widely used generic outcome measure¹³ which consists of eight domains; PF, role-physical (RP), BP, general health (GH), vitality (VT), social functioning (SF), role-emotional (RE) and MH. The SF-36 is self-explanatory and takes about 10 min to complete. The SF-36 is scored from 0 to 100; 0 indicating extreme problems and 100 indicating no problems. The Acute Swedish version of the SF-36 was used¹⁴.

COMORBIDITIES

Patients were asked to report comorbid conditions. They were asked if they were currently treated by a doctor, or had been treated during the last year, for any of the following 11 conditions: back problems, lung disease, high blood pressure, heart disease, impaired circulation in the lower extremity, neurological disease, diabetes, cancer, ulcer, kidney disease, impaired vision or eye disease.

STATISTICS

Statistical analysis was done using SPSS 15.0.

To describe the results, continuous outcomes are given as mean \pm SD and range. The Wilcoxon signed-rank test was used for paired comparison. Ordinal data are given as percentages.

Age, gender, comorbid conditions, preoperative scores of SF-36 PF, BP and MH were entered as predictors in an analysis of covariance (ANCOVA) where the five different KOOS subscales were used as the dependent variable. BMI was assessed at the 5-year follow-up only and thus is not included in the predictive models. BMI at 5 years did not correlate with the dependent variables (KOOS subscales) at 5 years (ρ -0.16–-0.06, $P > 0.3$).

For correlations of the items of the Sport/Rec subscale of KOOS and continuous variables such as age and BMI, Spearman's rank correlation was used. The Chi-square test was used to test relationship to gender and for comparison of the proportions of patients performing items of the KOOS subscale Sport/Rec postoperatively and preoperatively.

Results

PATIENTS

At the 5-year follow-up, nine patients had died and responses were available for 80/93 (86%) patients, mean age 76 years (range 59–90), 47 women and 33 men, mean BMI 28.16–38. Preoperative patient characteristics are given in Table I.

KOOS

At the 6 months follow-up the patients had improved ($P = < 0.001$) in all five subscales of the KOOS. At 12 months they had improved further in all subscales ($P = < 0.001$) except Sport/Rec ($P = 0.75$). At the 5-year follow-up a deterioration was seen in the subscale ADL compared to the 12 months follow-up ($P = < 0.001$), Fig. 1.

SF-36

At the 6 months follow-up the patients had improved in all SF-36 subscales ($P = < 0.001$ for all subscales except GH, $P = 0.02$). At 12 months no further significant improvements were reported and at the 5-year follow-up deteriorations were seen in the subscales BP, PF and VT in relation to the 12 months follow-up ($P = < 0.01$) Fig. 2.

OUTCOME IN RELATION TO PREOPERATIVE PAIN AND FUNCTION

To demonstrate the possible influence of preoperative KOOS pain score on postoperative KOOS pain score at 6 months, 12 months and at the 5-year follow-up, the patients were analyzed according to preoperative KOOS pain score quartiles (≤ 28 , 29–36, 37–50, ≥ 51). The mean KOOS pain score for each group at the different assessments are shown in Fig. 3. At the 6 months and 12 months follow-up the patients with a preoperative KOOS pain score in the lowest preoperative quartile (≤ 28) reached almost the same level as the patients in the upper preoperative quartiles, but at the 5-year follow-up the patients from the lowest quartile had declined the most, from 82 to a score of 72. Similarly, preoperative KOOS ADL score also correlated with the KOOS ADL score at the 5-year follow-up. The mean postoperative KOOS ADL score for the patients according to their preoperative KOOS pain score quartiles (≤ 32 , 33–39, 40–49, ≥ 50) are shown in Fig. 4. The patients in the lowest quartile had the greatest improvements in mean score at the 5-year follow-up, and also comprised the group which declined the most between 12 months and 5 years 80–66.

Table I
Preoperative clinical characteristics

No. of comorbid conditions	1.26 \pm 1.16
Percentage of patients with ≥ 2 comorbid conditions	36.5
No. of years the patient has considered TKR	2.43 \pm 2.2
Expected time (months) for recovery	3.76 \pm 2.22

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