

The Risk of Contralateral Total Knee Arthroplasty After Knee Replacement for Osteoarthritis

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ABSTRACT. Objective. Osteoarthritis (OA) is the most common indication for total knee arthroplasty (TKA), but the rate of contralateral disease progression after unilateral TKA as well as risk factors that may predict progression have not been determined. We assessed the overall rate of contralateral knee replacement after initial TKA for OA as a marker of progression to advanced symptomatic OA.

Methods. A total of 117 consecutive patients undergoing unilateral TKA for OA between 1983 and 1988 were evaluated and followed longitudinally for up to 14 years. Evaluation of potential risk factors for progression to contralateral TKA included age, sex, side of surgery, body mass index (BMI), and Kellgren-Lawrence (K-L) grade.

Results. The contralateral knee progressed to TKA in 31 patients, yielding an overall 10-year risk of contralateral TKA of 37.2%. The baseline K-L grade of the contralateral knee was strongly correlated with future risk of TKA ($p < 0.001$). Mean survival times were similar for those with grade II (131.7 mo) and grade III (127.6 mo); patients with grade IV, however, had a mean survival of 80.5 months, with an overall 10-year risk of TKA of 62.7%. Age, sex, side of initial TKA, and BMI were not risk factors for progression to contralateral TKA.

Conclusion. In this cohort, the K-L grading scale was a highly significant predictor for progression of contralateral OA to TKA. These data may provide important information to patients undergoing TKA, and shed light on the natural history of contralateral OA after TKA. (*J Rheumatol* 2003;30:1822–4)

Key Indexing Terms:
OSTEOARTHRITIS
NATURAL HISTORY

ARTHROPLASTY

JOINT REPLACEMENT
PROGRESSION

Osteoarthritis (OA) of the knee is responsible for vast costs both from lost economic activity and from direct medical expense^{1,2}. Total knee arthroplasty (TKA) is increasingly commonly performed in the advanced stages of knee OA to restore function and relieve pain; in 1997, 259,000 TKA were performed in the United States, compared to 129,000 in 1990³. Advances in biomaterials have greatly improved the durability of prostheses, and there is a wealth of information concerning the natural life of knee replacements⁴⁻⁷. There are, however, few data describing outcomes in the contralateral knee. Although 2 studies have examined the overall rate of progression of the contralateral knee to TKA^{8,9}, there are virtually no data by which an individual patient's longterm risks of requiring contralateral arthroplasty may be estimated.

MATERIALS AND METHODS

Patients. Study subjects included all patients who underwent primary TKA for advanced OA in a 3 surgeon group at Rush-Presbyterian-St. Luke's Medical Center from 1983 to 1988. Because this was a retrospective study, all clinical decisions regarding patient care and indication for contralateral arthroplasty were made by patients and physicians without regard to study protocol; the indications for TKA in these patients included severe pain refractory to medical therapy and/or significant interruption of lifestyle due to the OA. Patients who had previously undergone contralateral TKA ($n = 16$) or structure-altering procedures such as fusion or above-knee amputation ($n = 2$) were excluded from the study. In addition, all patients who underwent a contralateral TKA at the time of the index surgery or within 6 months were excluded ($n = 23$). The resulting group consisted of 117 patients (86 women, 31 men) (Table 1). All were followed for at least 12 months, except 2 patients who died within 12 months of their surgery.

Collection of data. A database containing annual clinical followup information about each patient undergoing TKA has been maintained in the Department of Orthopedic Surgery at our hospital. Baseline data including perioperative body mass index (BMI), sex, and side (left vs right) of the initial TKA were obtained from this database. Preoperative bilateral weight-bearing anteroposterior (AP) radiographs of the knees were available for 98 of the 117 patients, hence evaluations of radiographic risk factors for future contralateral TKA were restricted to these 98 subjects. One physician experienced in the Kellgren-Lawrence (K-L) system¹⁰ and blinded to the clinical history of the patients graded severity of the contralateral (nonoperated) knees. Among those patients who had clinical progression of OA requiring contralateral knee arthroplasty, followup for this study was terminated at the time of the contralateral TKA.

Statistical methods. The lifetime risk of undergoing a contralateral TKA was estimated by Kaplan-Meier analysis. The predictive values of BMI and

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Table 1. Characteristics of the 117 patients with OA of the knee and unilateral TKA.

Characteristic	
Age, yrs, mean (range)	67.3 ± 8.87 (35–87)
No. of women, men	86/31
Years of followup, mean (range)	7.2 (1.14)
Side of TKA, left/right	55/62
Body mass index, mean (range)	29.2 (18.8–55.9)
Radiographic OA of contralateral knee, n	
K-L grade I	11
K-L grade II	21
K-L grade III	36
K-L grade IV	30

K-L grade as potential risk factors for eventual contralateral TKA were assessed using the multivariate Cox proportional hazards model.

RESULTS

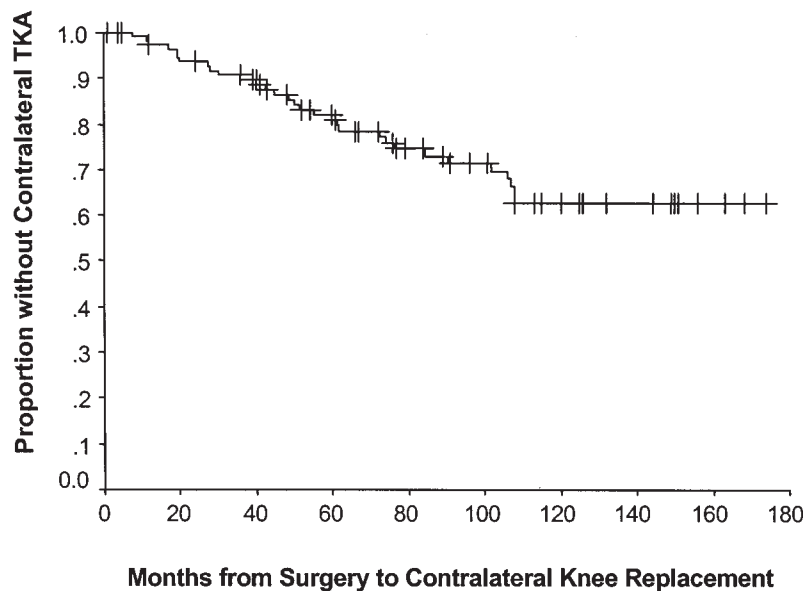
In total, 117 patients were evaluated and followed for a median duration of 7.2 years (range 1–14 yrs). During this time, 31 patients underwent contralateral TKA (26.4%), yielding overall 10-year risk of contralateral TKA of 37.2% (Figure 1). Using the Kaplan-Meier method, sex and side of initial TKA were evaluated for an association with contralat-

eral disease progression. There was no difference in risk of contralateral TKA between men and women (log rank statistic 1.46; $p = 0.22$) (Figure 2A), nor was there a difference between the left knee and right knee at initial TKA (log rank 0.03; $p = 0.85$) (Figure 2B). Age and BMI were evaluated for their effect on future contralateral TKA using the Cox proportional hazards method. Neither age ($p = 0.29$) nor BMI ($p = 0.33$) was a significant risk factor associated with contralateral surgery.

Among the 98 patients with available radiographs, K-L grade of the contralateral knee at the time of the index surgery was found to correlate strongly with future risk of contralateral TKA (log rank statistic 0.79; $p = 0.0003$). The Kaplan-Meier model predicted that mean survival time to contralateral arthroplasty was similar for those patients with K-L grades of II and III, 131.7 months (confidence interval 110.5, 152.8) and 127.6 months (CI 107.15, 148), respectively. However, those with grade IV had a mean survival time of only 80.45 months (CI 61.37, 99.52), whereas no patient in this study with a grade of 0 or I progressed to TKA (Figure 2C).

DISCUSSION

Patients undergoing TKA often seek advice concerning the



Time until Contralateral Knee Requires TKA

Year interval	No. Left	No. Failed	Cumulative Survival
0.00	116	0	1.000
1.00	111	3	0.9737
3.00	91	10	0.9070
5.00	73	18	0.8220
7.00	56	24	0.7458
10.00	27	31	0.6279

Figure 1. Kaplan-Meier analysis of the time to contralateral surgery after total knee arthroplasty (TKA) for OA. Overall, the 10-year risk of undergoing contralateral TKA was 37.2%.

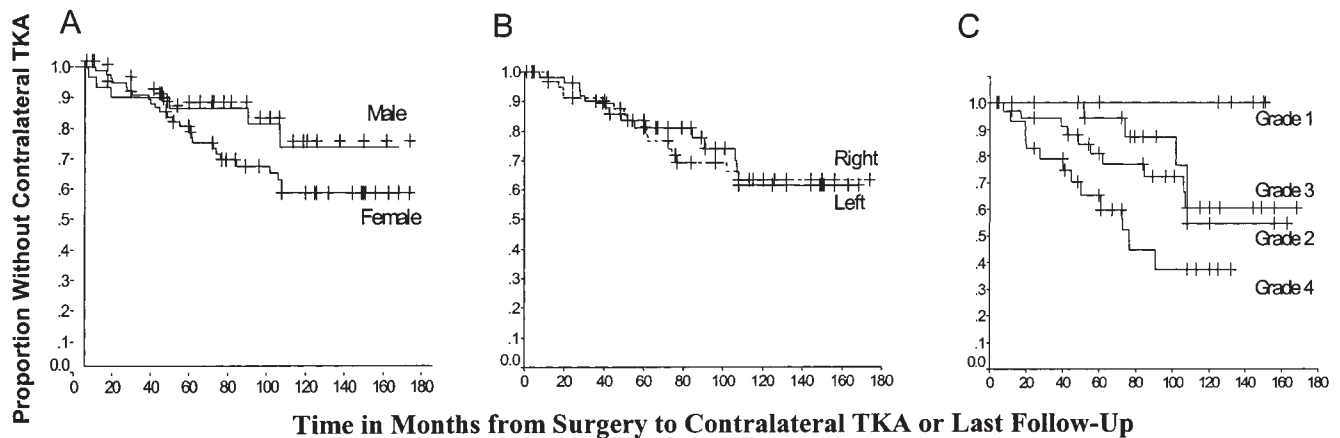


Figure 2. A. Kaplan-Meier analysis of male/female sex and the risk of future total knee arthroplasty (TKA). There is no apparent difference ($p = 0.22$). B. Kaplan-Meier plot of the risk of future contralateral TKA, stratified according to side of the initial surgery. There is no difference between the left and the right knee ($p = 0.85$). C. Kaplan-Meier analysis of Kellgren-Lawrence grade and the risk of TKA. Kellgren-Lawrence grade was found to strongly correlate with future risk of TKA ($p = 0.0003$).

odds of eventually requiring contralateral TKA. These analyses provide unique data enabling quantification of that risk. Overall, the 10-year risk of undergoing TKA in our study population was 37.2%. In addition, however, the risks for individual patients may be stratified according to the K-L grade of the contralateral knee at the time of the index TKA. Those patients with grade IV (severe OA) may be expected to undergo contralateral TKA in a mean of less than 7 years, those with grade II or III (moderate OA) may be expected to require TKA in 10 to 11 years, while patients with a grade of 0 or I (no or minimal OA) may not progress to contralateral TKA at all.

Although BMI¹¹, increasing age, and female sex¹² have previously been correlated with the development of bilateral knee OA, we found no association between these risk factors and a patient's risk of future contralateral progression to TKA. It is possible that the sample size of our population was too small to reveal a correlation between these traditional risk factors for OA and future contralateral TKA. Our findings are consistent, however, with the results of Wolfe and Lane¹³, which suggest that although BMI and other risk factors may predispose individuals to incident knee OA, they may not contribute to progression of the disease once it is established.

The Kellgren-Lawrence grading scale has been criticized because of its subjective nature and its overemphasis on osteophytes¹⁴. In our cohort of patients with preexistent significant OA in at least one knee, however, it was a highly significant predictor of progression to contralateral TKA. This information may be helpful for clinicians to advise patients undergoing a primary total knee arthroplasty for OA of their future risk of requiring a contralateral procedure.

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