Outcome of isolated tibial polyethylene insert exchange after uncemented total knee arthroplasty

27 patients followed for 8–71 months

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Background **The outcome of performing isolated tibial polyethylene insert exchange (ITPIE) after total knee arthroplasty (TKA) is under debate. We evaluated the survival probability of ITPE after uncemented TKA.**

Method **27 patients (27 knees) with an ITPIE performed mean 9 (0.9–17) years after the initial TKA were included in the study (22 patients also had the patellar component replaced simultaneously). All patients had their exchange performed at our department between 1997 and 2001 and had their latest follow-up examination mean 40 (8–71) months after the exchange.**

Results **During the follow-up, 2 patients had total knee revision because of aseptic loosening and 2 patients had isolated patella component exchange (in 1 of the patients, combined with a new ITPIE). Kaplan-Meier survival analysis gave a survival probability of 80% at 34 months of follow-up.**

Interpretation **The short-term survival after an ITPIE was similar to that of a total knee revision with exchange of all components. Since the ITPIE is a much smaller operation with fast rehabilitation, we recommend it in elderly patients with a well-fixed and well-aligned prosthesis without surface damage of the components.**

Survival of a primary total knee arthroplasty (TKA) is estimated to be beyond 10–15 years for more that 90% of all TKAs (Weir et al. 1996, Font-Rodriguez et al. 1997, Robertsson et al. 2001). Wear of the tibial polyethylene insert is one of the major causes of failure of the modular TKA implants (Sharkey et al. 2002). In 15% of all revisions, failure of the tibial polyethylene insert was reported to be the only cause—or one of the causes—of revision according to the Danish Knee Arthroplasty Register (Lund 2002).

Modular TKA implants give the opportunity to preserve undamaged and well-fixed implants at revision. However, Bert et al. (1998) found that in TKAs revised because of tibial polyethylene failure, an isolated tibial polyethylene insert exchange (ITPIE) was only possible in less than 15% of cases because of substantial scarring and/or damage to the tibial or femoral component. To date, only 2 published studies have reported results after ITPIE (Engh et al. 2000, Babis et al. 2002). Babis et al. (2002) concluded that ITPIE should be performed with caution, because of a surprisingly high rate of early failure. The aim of the present clinical investigation was to determine the survival probability of uncemented TKAs after ITPIE.

Patients and methods

During 1997 through 2001, 27 patients (9 men, 27 knees) with uncemented TKA had a primary ITPIE performed at our department. During the same

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period, we also performed 133 total knee revisions. The mean age of the patients was 70 (46–88) years. The study was approved by the local ethical committee of Copenhagen and Frederiksberg ((KF) 01-201/02) and all patients received oral and written information before informed consent was obtained.

The initial TKA operation was performed because of primary osteoarthrosis (n = 15), secondary osteoarthrosis (n = 8), or rheumatoid arthritis (n = 4). The implants used were either a porous-coated anatomic (PCA) prosthesis (Howmedica) (n = 23), a Duracon prosthesis (Stryker Howmedica) (n = 2), and one each of a press-fit condylar (PFC) prosthesis, (Johnson and Johnson), and an Interax prosthesis (Stryker Howmedica). All tibial and femoral components were implanted without use of bone cement. It was only possible to get information from the patient files of 14 patients regarding the size of the tibial inserts implanted during primary TKA. The mean thickness of these tibial inserts was 9.5 (7–16) mm.

The operations with ITPIE were performed 9 (0.9–16.9) years after initial surgery. Most patients (n = 22) also had the patellar component replaced, but all had well-fixed tibial or femoral components and these components were not replaced. The average thickness of the modular tibial inserts implanted at revision was 11 (8–25) mm. The main indications for the ITPIE operations were tibial polyethylene insert wear (n = 25), knee instability caused by too small a tibial insert implanted at the time of primary TKA (n = 1), and pain (n = 1). Preoperatively, wear of the tibial polyethylene insert was diagnosed by clinical examination combined with anterior-posterior and lateral radiographs showing narrowing or reduction of the space between the femoral component and the tibial baseplate. The decision to perform an ITPIE was taken preoperatively; this decision was changed to a total revision during the operation only in a few cases, i.e. if loosening of tibial or femoral components, severe wear of tibial of femoral components, or obvious malrotation of components was found. A preoperative knee score and a functional score calculated using The Knee Society Clinical Rating System (Insall et al. 1989) was obtained from the Danish Knee Arthroplasty Register.

Most patients were followed on a regular basis within our own department, but to ensure that no revision after the ITPIE had been performed at other orthopedics departments, all patients (knees)—including those who died before the time of follow-up—were checked for possible admissions to a department of orthopedic surgery in Denmark. This survey was performed during the spring and summer of 2003 using a nationwide register (Det Grønne System; Scandinavian Healthcare Informatics A/S, Aarhus, Denmark). If a patient had been admitted to another department of orthopedic surgery, sufficient information was collected from the hospital files to allow the author to decide whether the TKA had been revised, including date and cause of revision and which components were actually loose. The 4 patients who died during the study period with the prosthesis in situ, although censored during the survival analysis, were recorded as not revised.

At follow-up, the patients were examined clinically and had radiographs taken in the standing position. The data collected were used to calculate a knee score and a functional score (Insall et al. 1989). Radiographs were evaluated by a radiologist and the radiographic lucency scores of the femoral and tibial components were measured according to the Knee Society Roentgenographic Scoring System (Ewald 1989) (Figure). Also, routine standing radiographs obtained during the first 6 months after the ITPIE were available for 24 knees and these were used to calculate the knee alignment.

Statistics

Kaplan-Meier survival analysis was used to determine the survival probability of the TKAs after the ITPIE. A TKA was considered to be a failure if any operation of the affected knee had been performed after ITPIE, or if severe knee pain was reported. Pre- and postoperative knee and functional scores were compared using t-test for paired data.

Results

Average follow-up time after ITPIE was 40 (8–71) months. 2 patients were treated with total knee revision after 28 and 31 months because of aseptic loosening. 2 patients had additional surgery; 1 had exchange of an isolated patella component

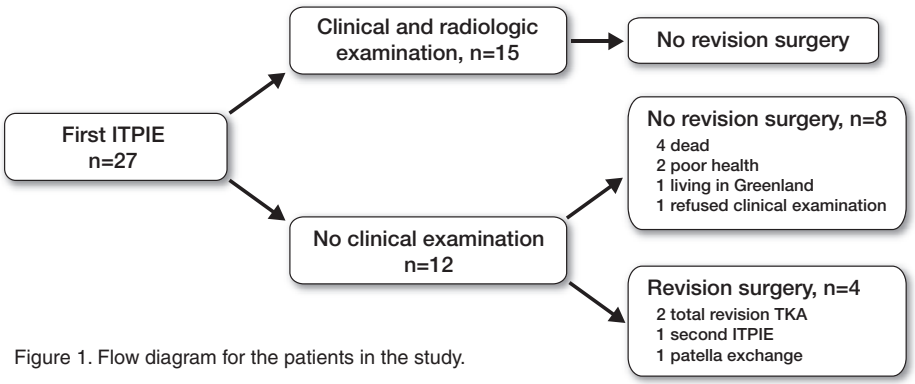

Figure 1. Flow diagram for the patients in the study.

34 months after the ITPIE, and another patient had a patella component exchange combined with a new ITPIE because of severe wear 23 months after ITPIE. Thus, 23 patients did not require additional revision surgery after the initial ITPIE, and the average follow-up time of these patients was 42 (8–71) months. 4 patients died on average 21 (8–32) months after the ITPIE operation, but all without having had any further operation on the affected knee (Figure). From the routine standing radiographs obtained during the first 6 months after the ITPIE, alignment of 24 knees not revised was 184° (179–188) and for the 4 knees that were revised the alignment was 185° (183°–189°). No patient had severe pain, and the average Knee Society knee and function scores were 70 (39–91) and 72 (30–100). For 13 of the patients, a preoperative score just before ITPIE was also available and both the knee and function scores (37 (15–72) and 47 (15–70), respectively) were lower than the scores at follow-up, with p-values of 0.001 and 0.01.

The survival probability of the TKAs after ITPIE was 80% at 34 months of follow-up, when all additional operations of the affected knee after ITPIE or severe knee pain were considered as failure. If only an additional operation with exchange of tibial or femoral components was considered as failure, the survival probability was increased to 90% at 31 months of follow-up.

Radiographs taken at follow-up in 15 knees that did not have any additional surgery showed an average radiographic lucency score for the tibial components of 2.6 (0–8). 1 of the femoral components had a high radiological lucency score because of an almost total lack of trabecular bone of the distal femur, but the remaining femoral components (n = 14) had an average radiographic lucency score of 1.6 (0–6).

Discussion

We found a survival probability of 80% at 34 months of follow-up for uncemented TKAs after ITPIE performed mainly because of severe tibial polyethylene wear, and we recommend ITPIE for elderly patients with well-fixed and well-aligned prostheses without surface damage of the components—and especially if the TKA has been functioning well for many years.

It is difficult to compare our results to the previous studies of Engh et al. (2000) and Babis et al. (2002) directly, because their study groups are not very homogeneous and neither of the studies used the same criteria for failure of the TKA. Our study showed the best results, with a higher probability of implant survival. On the other hand, our study material was smaller and had a shorter follow-up. Furthermore, radiographs of knees that did not have any additional surgery had relatively high radiographic lucency scores for both femoral and tibial components. This may indicate that our revision rate will increase with time, and the conclusion that ITPIE might be beneficial may turn out to be wrong in the longer term.

The alternative to an ITPIE is a total revision with exchange of well-fixed tibial and femoral components. Such a larger operation might result in bone loss during surgery and the need for more constrained implants with intramedullary stems, sometimes combined with structural allografts. In general, the survival probability of revision TKA

is approximately 75–90% at 5–8 years postoperatively (Knutson et al. 1994, Peters et al. 1997), and thus the short-term survival of an ITPIE and a revision TKA with exchange of all components seems to be comparable.

Contributions of authors

CLJ: data collection, analyzing results and manuscript. MMP: analyzing results, manuscript. KEJ: analyzing radiographs. MT: study design, analyzing results. HS: study design, data collection, manuscript.

No competing interests declared.

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