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Original Article

Uncemented Metal-Backed Tantalum Patellar Components in Total Knee Arthroplasty Have a High Fracture Rate at Midterm Follow-Up

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ABSTRACT

Background: There is interest in uncemented total knee arthroplasty due to the hope for long-term biologic fixation, but limited data are available regarding uncemented tantalum patellar components. The purpose of this study was to evaluate the radiographic outcomes of uncemented tantalum patellar implants at midterm follow-up.

Methods: We retrospectively reviewed a consecutive series of 30 knees in 29 patients who underwent cementless total knee arthroplasty with an uncemented metal-backed tantalum patella between September 2006 and April 2009. Patients were required to have a minimum radiographic follow-up of 2 years. Anteroposterior and lateral radiographs of the knee were evaluated for signs of implant fracture or gross loosening. Clinical follow-up was obtained by reviewing each patient's most recent orthopedic record.

Results: Thirty knees in 29 patients met inclusion criteria. The mean age of the cohort was 59.1 years with a mean body mass index of 31.9 kg/m^2. Mean postoperative radiographic follow-up time was 5.5 years. Six fractures of the patellar component were noted. This represented a fracture rate of 20% among the entire cohort and 35% among the 17 knees with visible patellae on anteroposterior radiograph. All fractures had a transverse pattern. No gross patellar component loosening was noted. Among patients with component fractures, 2 required revisions for instability and 1 revision was for infection.

Conclusion: Our results suggest a minimum 20% rate of component fracture at midterm follow-up. Although many of these patellar component fractures were asymptomatic, they have the potential to impact revision rates in the longer term.

Although cemented total knee arthroplasty (TKA) remains the gold standard for operative management of end-stage knee arthritis, there has been a renewed interest in uncemented TKA owing to the hope for long-term biologic fixation. Structural and biomaterial changes in modern cementless knee designs have sought to reduce the historically high rates of failure, stemming from both the uncemented metal-backed patellar components and aseptic loosening of the tibial components [1–3]. Several recent studies have demonstrated comparable survivorship rates at midterm follow-up with the use of modern cementless femoral and tibial components [3–8]. However, there are limited data available regarding newer uncemented metal-backed patellar component designs.

The purpose of this study was to retrospectively review a consecutive series of patients who underwent cementless TKA using a porous tantalum design after observing several component fractures in these implants during routine follow-up. Our goals were to identify the risk of patellar component fracture and whether these fractures could be linked to certain patient characteristics.

Materials and Methods

This was a retrospective case review of all patients who underwent cementless TKA at a single Veterans Affairs medical center between September 2006 and April 2009. The study was performed with the approval of the institutional review board at our

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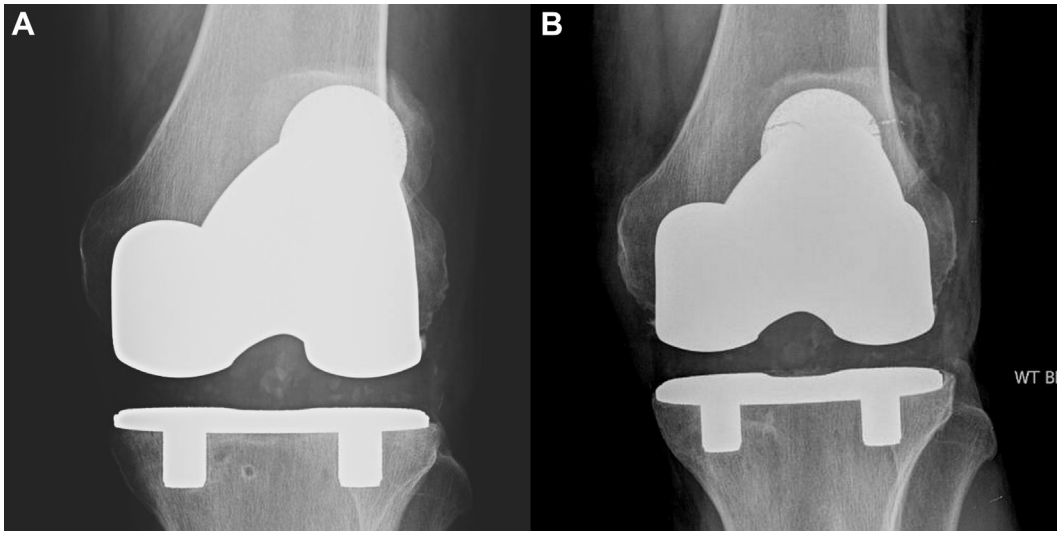

Fig. 1. Anteroposterior radiographs of the knee before (A) and after (B) patellar component fracture in a 59-year-old man who underwent uncemented total knee arthroplasty (TKA) with a cementless tantalum monoblock design. Component fracture was first observed at 1.4 years postoperatively.

institution. Inclusion criteria for this study required patients (1) to have had an uncemented tantalum metal-backed patellar component as part of their TKA and (2) to have postoperative weightbearing anteroposterior (AP) and lateral radiographs of the knee at a minimum of 2 years after surgery. Initial review identified 56 knees in 54 patients who underwent cementless TKA using an uncemented tantalum metal-backed patellar component. Thirty knees in 29 patients were found to have adequate radiographic follow-up time for inclusion.

Patient demographic information was obtained from our institution's electronic medical record. This included age, height, weight, gender, and operative side. Body mass index (BMI) was calculated from the patient's height and weight at the time of the patient's initial surgery. Operative notes were used to collect information regarding implant size. Clinical notes from postoperative orthopedic follow-up visits were reviewed to identify subsequent reoperations. All postoperative radiographs of the knee for each patient were evaluated for signs of implant fracture or gross loosening (as determined by periprosthetic lucency of >2 mm around the component or interval change in position) with the use of a picture archiving and communication system (Philips Medical Systems, Netherlands) software.

All TKAs were performed using a cementless posterior-stabilized femoral component composed of cobalt chrome with a titanium fiber metal mesh porous ingrowth surface (Zimmer, Warsaw, IN). The cementless tibial component consisted of a monoblock tibial design with a porous tantalum ingrowth surface and 2 hexagonal pegs for fixation into the tibial metaphysis (Zimmer, Warsaw, IN). The cementless patellar component was a monoblock, single-peg, metal-backed design with the polyethylene directly compression molded from powder into the porous tantalum ingrowth surface (Zimmer, Warsaw, IN). Procedures were performed by 8 fellowship-trained arthroplasty surgeons. All TKAs were performed with the tourniquet inflated using a standard medial parapatellar approach. The implants were inserted according to the manufacturer's recommended technique. Preparation of the patella included circumferential debridement of the soft tissue around the patella. The patellar cut was made in a planar fashion with the use of a patellar guide. Patellar component size was determined using the manufacturer's sizers. Postoperatively, a structured protocol was followed, which involved early mobilization and weightbearing with physical therapy. Patients returned for clinical and radiographic follow-up at standard postoperative intervals.

Comparison of demographic variables between patient cohorts was performed using a Student t test with $P < .05$, indicating statistical significance.

Results

The patient cohort consisted of 30 TKAs in 29 patients. All patients were male with a mean age of 59.1 years (range, 47.7-75.0 years). The mean patient height, weight, and BMI were 70 inches (range, 66-77 inches), 225.9 lbs (range, 156.0-370.2 lbs), and 31.9 kg/m^2 (range, 21.8-48.0 kg/m^2), respectively. Seventeen TKAs were performed on the left and 13 on the right. Final radiographic follow-up averaged 5.5 years (range, 2.1-9.2 years), with the most recent clinical follow-up at a mean of 5.1 years (range, 0.2-9.3 years).

Six fractures of the metal-backed patellar component were observed on radiographs. These fractures were first noted at an average of 5.4 years (range, 1.4-8.6 years) postoperatively. All component fractures demonstrated a transverse pattern (Fig. 1). No patellar components were noted to have radiographic evidence of gross loosening. This represented a patellar component fracture rate of 20% among the entire patient cohort. If the cohort was further narrowed to the 17 patients in whom the patella was unobscured by the femoral component on AP radiograph of the knee, the fracture rate was calculated to be 35%.

Among the 6 TKAs with patellar component fractures, 4 required reoperation. One reoperation was for manipulation under anesthesia due to arthrofibrosis. The remaining 3 reoperations required revision of the components. Two were performed for instability with revision to a constrained prosthesis and retention of the patellar component, which was noted to be well fixed at the time of surgery. The third revision was performed for a chronic prosthetic joint infection requiring component explant. During this procedure, the patellar component was noted to have only a fibrous ingrowth (Fig. 2). The remaining 2 patients with patellar component fractures were asymptomatic at their most recent follow-up. None of the patients with component fractures were noted to have a traumatic event in their follow-up records.

For the 24 TKAs without patellar component fracture, 3 required reoperation. One reoperation was for manipulation under anesthesia due to arthrofibrosis. A second patient underwent