The Journal of Arthroplasty Vol. 22 No. 3 2007

Case Report

Failure of a Metal-Reinforced Tibial Post in Total Knee Arthroplasty

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Abstract: Failures of the polyethylene tibial post in posterior stabilized total knee arthroplasty are usually associated with pain and knee instability. We report an unusual presentation of a tibial post failure that occurred after the polyethylene insert was revised in a posterior-stabilized total knee. The tibial post on the revised insert broke off, exposing a metal reinforcing pin. During the resulting posterior subluxations of the tibia, the metal pin articulated against the cam on the femoral component, resulting in the generation of metallic debris in the knee joint.
Key words: tibial post failure, revision TKA, posterior-stabilized TKA, knee pain, knee instability.

Posterior cruciate–substituting implants are commonly used in posterior-stabilized primary total knee arthroplasty (PS-TKA) [1,2]. After the posterior cruciate ligament is cut, a femoral cam and tibial post [2], or a congruent polyethylene insert with an elevated anterior rim [3], can be used to restore posterior stability to the knee joint.

As a mechanical restraint against posterior tibial subluxations, the polyethylene tibial post is susceptible to damage related to impingement, wear, and breakage [4-6]. Failures of the tibial post resulting in intermittent pain and instability have been reported in PS-TKA [7,8]. In the patient described below, knee instability after tibial post failure resulted in metallic debris from unexpected metal-on-metal contact between the prosthetic components.

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Submitted December 22, 2005; accepted April 15, 2006.
No benefits or funds were received in support of the study.
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0883-5403/07/1906-0004$32.00/0
doi:10.1016/j.arth.2006.04.011

Case Description

In May 1999, a 68-year-old woman underwent a cemented left primary TKA with the Sigma PFC total knee system (DePuy Orthopaedics, Warsaw, Ind) for degenerative disease related to rheumatoid arthritis. This procedure was done outside our facility, with standard posterior-stabilized total knee components. The surgeon used a medial parapatellar approach with posterior cruciate ligament sacrifice. No lateral patellar release was necessary according to the operative record, and the patient recovered uneventfully. Size [3] femoral and tibial components were implanted, with a 38-mm polyethylene patella. The tibial insert was 12 mm in thickness, with a central post designed to engage a cam on the femoral component and provide posterior stability during knee flexion.

The patient came to us in March 2001, complaining of a long history of the knee feeling unstable.

Fig. 1. Radiographic appearance of the total knee, after revision of the polyethylene insert with a thicker, constrained version that had a metal-reinforced tibial post.

She gave no history of trauma to the knee. On examination, the patient was 5 ft and 11 in tall, weighed 235 lb, and had a knee arc of motion from 0° to 130° with patella tracking in the midline. A valgus stress in extension produced 4° of opening in the knee, with 9° of opening produced by a varus stress. When tested in flexion, the total demonstrated increased laxity, particularly with a varus stress. Plain radiographs showed a routine, uncomplicated TKA. These findings led to the diagnosis of flexion instability in the total knee. When extensive conservative treatment failed to address the symptoms, repeat surgery was recommended.

During the revision operation, the total knee components were well fixed to bone. The tibial tray was implanted in internal rotation relative to the tibial tubercle, but the femur was externally rotated relative to the epicondylar axis. The patella was angulated laterally in the trochlear groove during range of motion, but no lateral patella subluxation was present. Ligamentous examination showed that the flexion gap was greater than the extension gap, and the knee had more laxity in varus than in valgus.

We elected to perform a limited revision because the components were well fixed to bone and the patella tracking was acceptable. Accordingly, the polyethylene insert was revised with a 17.5-mm-thick "stabilized plus" version from the same manufacturer (DePuy). The tibial post on the stabilized plus insert had increased height and width to provide additional constraint inside the box of the femoral component. The post was also designed to accept a metal reinforcing pin. After releasing soft tissues from the posterior recesses, knee extension was restored, and the flexion instability was corrected with the new polyethylene insert.

The patient recovered uneventfully, and her symptoms resolved. Seventeen months later, however, she complained of recurrent instability. Symptoms had begun 3 months before her presentation and had gotten progressively worse. The episodes of giving out were accompanied by a sensation of metal grinding, and painful swelling in the knee.

Examination demonstrated distinct end points on varus and valgus stress testing, consistent with the constrained tibial insert. A posterior force applied to the tibia in 90° of flexion did not demonstrate posterior instability, and no metallic noises could be reproduced. Radiographs were not helpful in diagnosing the problem (Fig. 1). An aspiration of the knee joint was performed, showing metal-stained synovial fluid. Laboratory data did not show any evidence of sepsis. Because of the recurrent instability, and the discolored synovial fluid, it was felt that the knee had a mechanical abnormality and surgical exploration was advised.

During the second revision procedure, a grossly deformed piece of polyethylene was found in the femoral notch. This piece had sheared off the tibial post, exposing the tip of the metal reinforcing pin

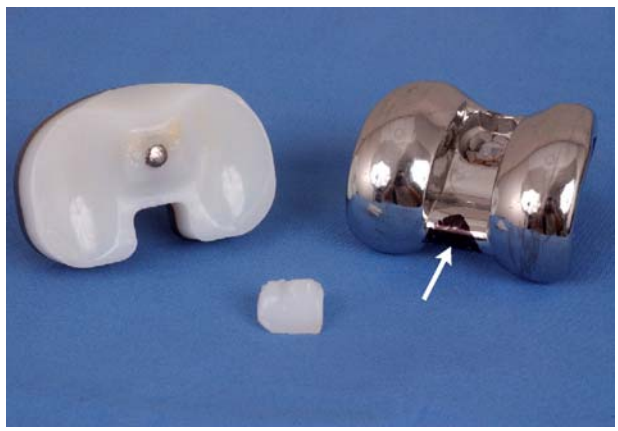

Fig. 2. Tibial post breakage exposed a metal pin within the post. The tip of this pin articulated against the femoral cam as the tibia subluxed posteriorly, producing metal debris inside the knee. The arrow points to an area marked with a pen; this area had gross scratching from contact with the metal tibial post pin.