

## Case Report

# Repeated Early Failure of a Newly Designed Hinged Knee System

Joshua K.L. Lee, MSc, FRCS (Tr&Orth), Vikram Chatrath, MD,  
and Paul R. Kim, MD, FRCSC

---

**Abstract:** We report a case of acute and recurrent accelerated wear of the polyethylene bushings of the hinge mechanism in the Zimmer Segmental Knee System. This resulted in an unacceptable recurvatum deformity leading to multiple revision knee operations, which was unexpected in a modern design hinged knee system. A custom modification of the original design was used to prevent further recurvatum deformity. The current design of the hinge post mechanism in this system appears to be inadequate, which led to the development of a significant recurvatum deformity in our patient. Surgeons should be aware of this potential complication when considering the use of this revision knee system. **Keywords:** total knee arthroplasty, implant failure, polyethylene wear, revision, hinged knee system.

© 2013 Elsevier Inc. All rights reserved.

---

Constrained prostheses have been used for performing knee arthroplasties in cases of instability [1], soft tissue imbalance [2], bone loss, or a combination of all of these [3]. This is a common situation in revision knee arthroplasty surgery. With increasing severity of the previously mentioned factors, modular segmental arthroplasty prostheses with rotating hinge articulations can be used to compensate for these significant deficiencies with reasonable outcomes [4]. Currently, third-generation modular rotating platform hinge knee systems are being used. These have been designed with improvements in the articulation of the rotating hinge mechanism, which, in earlier fixed hinge designs, was thought to contribute to premature failure [5].

The Zimmer Segmental Knee System (ZSKS) (Zimmer, Warsaw, Indiana) is a modern design salvage knee prosthesis intended to replace the distal femur, midshaft femur, proximal femur, and/or total knee in cases that require extensive resection and restoration. It is

designed to be compatible with the NexGen Rotating Hinge Knee (RHK) System (Zimmer). We report a case of acute and recurrent accelerated wear of the polyethylene bushings of the hinge mechanism in the ZSKS resulting in an unacceptable recurvatum deformity leading to multiple revision knee operations. A literature review did not reveal any prior reports of failure of this newly designed system. The following is a description of the case and its subsequent management.

### Case Report

A 72-year-old man with a body mass index of 36 kg/m<sup>2</sup> underwent a total knee arthroplasty (Zimmer Miller-Galante Knee Systems Zimmer) in 1997. The patient's medical history was significant for hypertension and diabetes controlled by oral hypoglycemics. This knee was revised in 2002 to a Zimmer LCCK (Zimmer) prosthesis due to aseptic loosening secondary to polyethylene wear. The intraoperative findings demonstrated significant osteolysis of the tibia and femur secondary to polyethylene wear due to oxidative degradation of the polyethylene. The patient recovered uneventfully with a postoperative range of motion from 0 to 90°.

The patient sustained a fall in 2006 and had a type III Lewis-Rorabeck distal femoral periprosthetic fracture; there was a normal distal neurological function and infection markers were normal. He underwent revision knee arthroplasty with open reduction and internal

---

*From the Division of Orthopaedic Surgery, The Ottawa Hospital/University of Ottawa, Ottawa, Ontario, Canada.*

Submitted February 1, 2012; accepted April 23, 2012.

The Conflict of Interest statement associated with this article can be found at <http://dx.doi.org/10.1016/j.arth.2012.04.029>.

Reprint requests: Paul R. Kim, MD, FRCSC, Division of Orthopaedic Surgery, The Ottawa Hospital, General Campus, 501 Smyth Rd., CCW 1650, Box 502, Ottawa, Ontario, Canada K1H 8L6.

© 2013 Elsevier Inc. All rights reserved.

0883-5403/2802-0038\$36.00/0

<http://dx.doi.org/10.1016/j.arth.2012.04.029>

fixation of the lateral condyle. A quadriceps turn-down was used to improve exposure. A significant femoral cavitory defect along with varus-valgus instability was noted intraoperatively. With these considerations, a NexGen RHK Zimmer knee was implanted. Two months later, the patient developed a quadriceps tendon rupture, which was repaired. The result of the workup at that time was negative for infection. The patient recovered with a range of motion from 5° to 90°.

The patient was then seen for regular follow-up visits. In 2007, the patient underwent a total knee arthroplasty on the right side, which was functioning well at the last follow-up. Four years after his last revision knee surgery, the patient presented with aseptic loosening of the femoral component along with significant distal femoral bone loss; again, the result of the workup for infection was negative. In February 2011, the patient underwent a revision knee arthroplasty with the ZSKS. This system is compatible with the RHK tibial component. Massive femoral cavitory defects were noted, along with severe ligamentous insufficiency necessitating the use of a distal femoral replacement arthroplasty. Intraoperatively, the RHK tibial component was confirmed to be well fixed and in good position and was, therefore, left in situ. The ZSKS (size C distal femoral component with 30-mm extension, 12 × 100-mm stem, 35-mm trabecular metal (TM) sleeve, and 12-mm polyethylene insert) was implanted without complication. Postoperatively, the patient was mobilized as per standard protocol.

Six weeks later, the patient presented to the clinic with complaints of “knee buckling.” On examination, the patient’s knee went into painless recurvatum of 20° on ambulation and 10° with elevation of the foot in a supine position (Fig. 1). Knee flexion was 100°. This system uses a unique bushing design that includes a mechanism for blocking hyperextension, rather than a separate “bumper” as seen in traditional rotating hinge designs. We postulated that the bushing had failed prematurely, and the patient was scheduled for revision knee surgery. Zimmer representatives and the system design engineer were present during the revision (June 2011). Intraoperatively, it was noted that the plastic bushing that prevents hyperextension had undergone severe deformation around the hinge. The polyethylene blocking piece had deformed both along the circular contact area with the axle and anteriorly where it was supposed to prevent recurvatum (Fig. 2). Because the tibial and femoral components remained well fixed and in good position, it was elected to insert a new set of polyethylene bushings, axle, and tibial insert, assuming the prior one had failed because of a potential polyethylene imperfection. Intraoperatively, this corrected the recurvatum deformity, and the knee was closed as per standard protocol. After surgery, we were informed by Zimmer that this similar issue had happened in 2 other cases that they were aware of.



**Fig. 1.** Lateral and anteroposterior x-rays of the ZSKS showing significant recurvatum deformity.

Two weeks later, the patient presented again with an onset of a recurvatum deformity of 15° similar to the previous occasion. There was no history of trauma, and radiographs did not reveal any mechanical issues with the prosthesis. Considering the recurrent and accelerated failure of the polyethylene blocking piece, it was decided to custom design a modification to the femoral implant to avoid full revision of his well-fixed components. The ZSKS allows for isolated exchange of the distal femoral component without having to revise the existing cemented stem construct. The custom-made piece was designed in consultation with the engineers of the ZSKS (Fig. 3). It was decided to fashion a positive “stop” in the system. This was done by adding a polyethylene button into a recess inside the box of the femoral component and adding a cobalt-chrome-raised bumper on the hinge post, which would contact the polyethylene button in full extension and, therefore, provide a mechanical block to hyperextension. In addition, the polyethylene bushings around the axle were also thickened to provide improved tolerances here. The other surgical option would have been to revise the whole implant to another salvage knee

Download English Version:

<https://daneshyari.com/en/article/6210144>

Download Persian Version:

<https://daneshyari.com/article/6210144>

[Daneshyari.com](https://daneshyari.com)