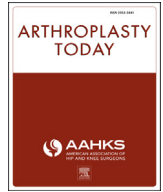




Contents lists available at ScienceDirect

Arthroplasty Today

journal homepage: <http://www.orthoplastytoday.org/>

Case report

Fracture of the femoral adapter bolt and taper adapter in a modern rotating platform knee arthroplasty

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ARTICLE INFO

Article history:

Received 7 December 2016

Received in revised form

24 January 2017

Accepted 24 January 2017

Available online xxx

Keywords:

Total knee arthroplasty

Revision

Implant failure

Modular

ABSTRACT

A 58-year-old woman presented with onset of pain associated with a popping sound after a twisting motion 4 years after left total knee revision arthroplasty. She had a complex medical history, including a reported bone cement allergy, and presented to the hospital unable to bear weight. Plain radiographs revealed a broken femoral component, with the femoral metaphyseal sleeve separated from the distal articular component. During surgery, it was observed that the femoral adapter bolt and taper adapter had both fractured. Scanning electron microscopy of the fracture surfaces of the components confirmed that the implant had failed in fatigue, presumably due to high cyclic loads. Failure at this junction has not been described previously. In this type of knee design, we recommend supporting the distal articular component either with bone, augmentation, and/or bone cement to reduce the risk for this mode of failure.

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Introduction

Modular components are widely used in both primary and revision total knee arthroplasty (TKA) procedures. Modularity allows for intraoperative customization, improved kinematic function, and improved fixation [1]. Porous titanium metaphyseal sleeves were introduced as a modular option to provide more advantageous fixation for challenging TKA surgeries [2]. These sleeves fit over a distal intramedullary stem that connects to the femoral component by a screw, bolt, and/or taper junction. The sleeves are intended to allow for load sharing across the joint and to provide stress relief for host bone [1].

Unfortunately, modularity has led to case reports of implant failure in both primary and revision TKAs. Early Optetrak designs

(Exactech, Gainesville, FL) experienced failures at the male taper junction of the femoral component and the stem extension [3], and 5 cases of the Insall-Burstein II Constrained Condylar design (Zimmer, Warsaw, IN) were reported for failure of the stem-condyle junction because of loose bolt connections [4,5]. DePuy (Warsaw, IN) introduced the SIGMA TC3 Rotating Platform, which connects the femoral component to the distal femoral stem through a femoral adapter and corresponding femoral adapter bolt. These modular junctions may also have a possibility of failure, although modular junction failure has not been previously reported in the TC3 implant. No reported cases of bolt failure were found in the FDA's MAUDE database as of November 4, 2016. We report a case of a spontaneous, catastrophic fracture of the femoral adapter and corresponding femoral adapter bolt of a noncemented TC3 Rotating Platform knee.

Case history

The patient is a 58-year-old woman with a history of hypertension, hyperlipidemia, fibromyalgia, reflex sympathetic dystrophy, asthma, spine surgery, and multiple left knee surgeries. She had undergone a left primary TKA in June of 2009, 8 months before presenting to the hospital with pain and a reported infection after a

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to <http://dx.doi.org/10.1016/j.artd.2017.01.003>.

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<http://dx.doi.org/10.1016/j.artd.2017.01.003>

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Please cite this article in press as: E.C. Baral, et al., Fracture of the femoral adapter bolt and taper adapter in a modern rotating platform knee arthroplasty, *Arthroplasty Today* (2017), <http://dx.doi.org/10.1016/j.artd.2017.01.003>

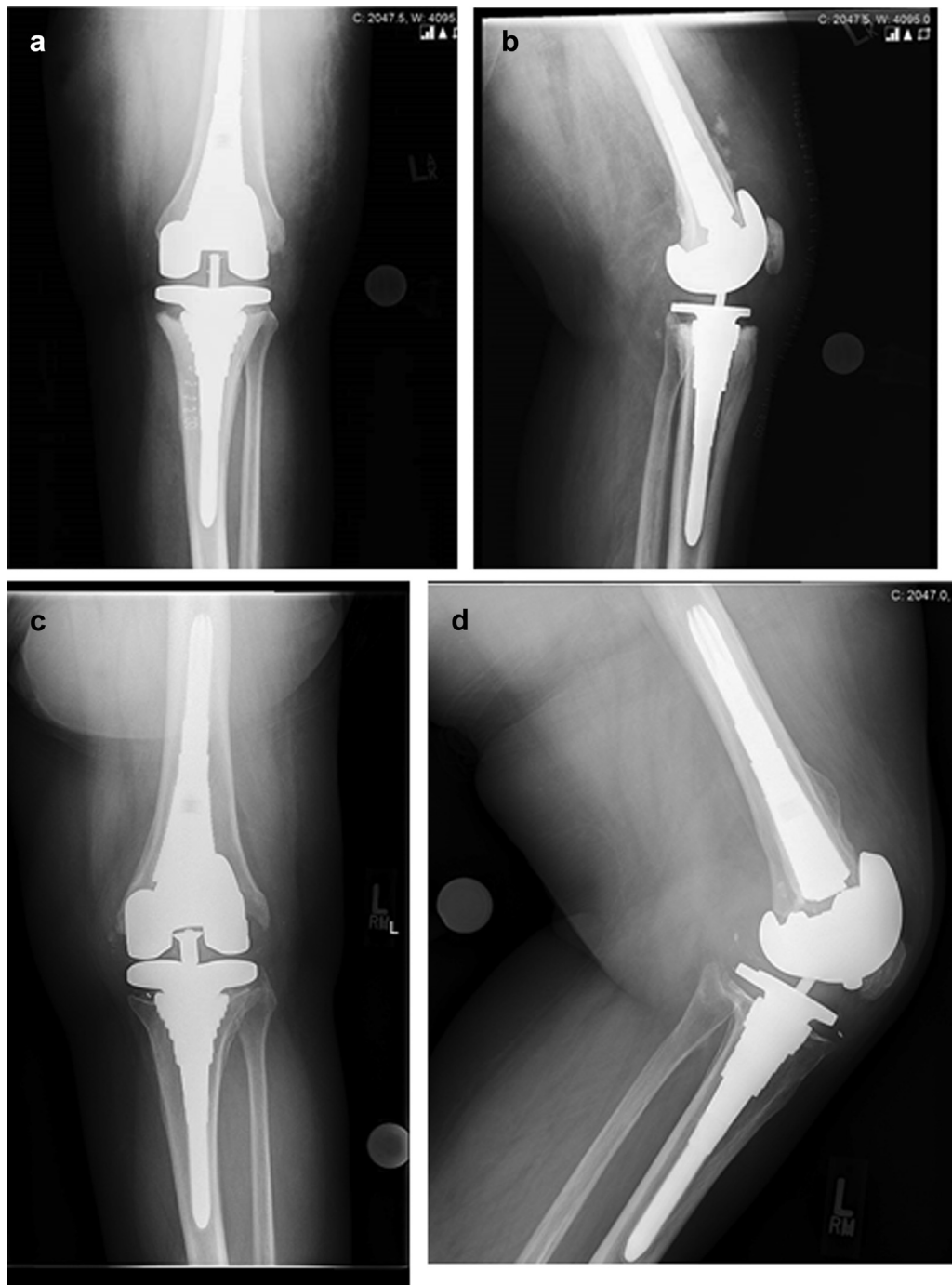


Figure 1. Anteroposterior (AP) (a) and lateral (b) radiographs obtained at revision surgery in 2010. 4.5 years later, the patient presented with onset of pain and AP (c) and lateral (d) views confirmed fracture of the implant and taper disengagement from the metaphyseal stem.

dental procedure. No evidence of bacteria was found, but the patient's pain continued to increase. All cultures were negative. Pathology found no histological evidence for infection despite the preoperative aspiration showing elevated white blood cell count, erythrocyte sedimentation rate and C-reactive protein. The negative aspiration results and inflammatory response at the cement-bone interface indicated a potential bone cement allergy. With this diagnosis, the initial 2-staged revision plan was abandoned in hopes of avoiding a second possible reaction to bone cement. A DePuy Press-fit TC3 Rotating Platform component was implanted with both lateral distal and medial posterior augments on the

femur and stems and sleeves on both the femoral and tibial components (Fig. 1). At her 1-month follow-up visit, the patient had full range of motion with stable flexion and extension. At her 3-month follow-up, she reported feeling better and had undergone spinal surgery, which she believed benefited her outcome. In her recovery from spinal surgery, she suffered a fall, which initiated minor pain in the joint; however, radiographs and clinical examination revealed no abnormalities with the revision implant.

In November of 2014, 4.5 years after her revision TKA surgery, the patient presented after twisting her knee. At the time of the twisting injury, she experienced an accompanying sudden popping

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