Arthroplasty Today xxx (2018) 1–5

Contents lists available at ScienceDirect

Arthroplasty Today

journal homepage: http://www.arthroplastytoday.org/

Case report

A case of bilateral hip mechanically assisted crevice corrosion after staged total hip arthroplasty

Carl L. Herndon, MD *, Roshan P. Shah, MD, JD, H. John Cooper, MD, Jeffrey A. Geller, MD

The Center for Hip and Knee Replacement, Columbia University Department of Orthopedic Surgery, New York, NY, USA

ARTICLE INFO

Article history:
Received 19 March 2018
Received in revised form
7 May 2018
Accepted 10 May 2018
Available online xxx

Keywords:
Mechanically assisted crevice corrosion
Adverse local tissue reaction
Revision hip arthroplasty
Immune reaction

ABSTRACT

Mechanically assisted crevice corrosion (MACC), also known as trunnionosis, and adverse local tissue reaction (ALTR) are entities that can lead to pain and necessitate revision in total hip arthroplasty (THA). We present a case of a 75-year-old female who received a bilateral staged primary THA with metal on cross-linked polyethylene implants and had subsequent bilateral revisions for MACC and ALTR. In both instances, she presented with anterior thigh pain, weakness, and difficulty ambulating, and she was revised to ceramic on cross-linked polyethylene implants. This case may suggest a biologic predisposition or systemic immunogenic reaction to metal debris in some patients with ALTR or represent an implant-specific complication. To our knowledge, this is the first case reported of a patient having bilateral MACC from staged THA performed by 2 different surgeons using the same brand implant.

Introduction

Large head metal-on-metal (MoM) total hip arthroplasties (THAs) are regarded as a failure of modern orthopedics [1,2]. The increased wear, release of metal ions into the synovium and blood stream, formation of pseudotumors, and other soft tissue complications led to a great number of revisions, industry recalls, and implant extractions. These failures contributed to research into adverse local tissue reaction (ALTR), its causes, and its biology [3,4]. These complications were initially thought to only arise from the MoM-bearing surface articulation of the implant. However, as similar findings were observed in patients with metal-on-polyethylene (MoP) implants, it became clear that release of metal ions and debris can also occur from nonarticulating junctions, including the modular femoral head-neck taper junction [1,5].

Patients with modular taper corrosion, also known as mechanically assisted crevice corrosion (MACC) or commonly known as trunnionosis, can present with hip, thigh, groin, or buttock pain, swelling, weakness, gross instability, or other vague lower extremity complaints [5-9]. Typically, plain radiographs may appear normal, but on advanced imaging, there may be soft tissue destruction and pseudotumor formation [5-8,10,11]. In the later stages of the process, there may be some subtle osteolysis by the calcar or the superolateral rim of the acetabulum. If left untreated, more obvious osteolysis may occur. The prevalence of this condition, according to one recent study, is 3.2% but varies by implant and date of surgery [12]. Patients may present as early as a few months from their index procedure and as late as 10 years, but they typically present between 1 and 3 years [4]. Symptomatic MACC at the head-neck junction in MoP THA appears to be reported in the literature more commonly with certain implants as well [12-14].

In this article, we describe such a case occurring in the same patient with 2 different surgeries, which to our knowledge is the first such report in the literature.

Case history

The patient was informed that data from her case would be submitted for publication, and she agreed.

The patient is a 75-year-old Caucasian female with a history of hypothyroidism and body mass index of 23.2 with bilateral hip osteoarthritis (Fig. 1) who underwent staged bilateral THA via posterolateral approach with 2 different surgeons, with the procedure

One or more of the authors of this article 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 https://doi.org/10.1016/j.artd.2018.05.003.

* Corresponding author. 622 W 168th Street, PH 11, New York, NY 10032, USA. Tel.: +1 847 769 4729.
E-mail address: ch3181@cumc.columbia.edu

https://doi.org/10.1016/j.artd.2018.05.003

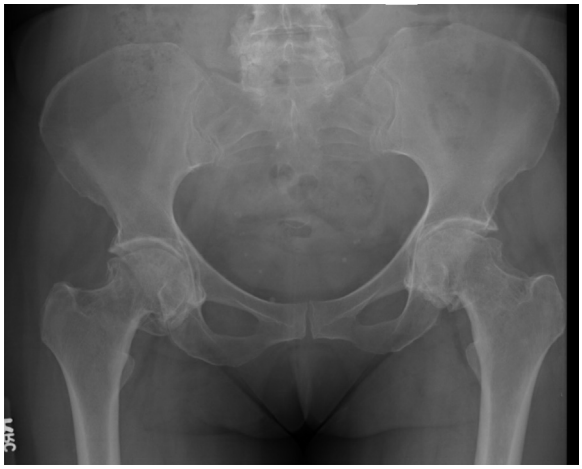

Figure 1. Anterior-posterior (AP) pelvis radiograph upon initial presentation showing bilateral hip osteoarthritis.

performed in right side in June 2009. She recovered well and was asymptomatic at the time of the left-sided surgery, 3 years later, performed in December 2012 by a second surgeon, which was similarly uncomplicated. She had 32-mm CrCo femoral heads on a titanium stem with a 12/14 taper on bilateral hips, both with Trilogy acetabular components and an M/L taper standard stem (right) and extended offset (left) (Zimmer Biomet, Warsaw IN). Neck lengths were +3.5 mm in the right hip and −3.5 mm in the left hip. Each femoral head was affixed with 3 mallet blows onto a straight head impactor, consistent with the surgeons' standard technique and force.

Approximately 5 years after her right THA, she presented with unilateral, worsening right hip pain, without pain on the left. She had no pain with walking but had pain in the groin area that radiated down her leg into the anterior thigh, which was exacerbated by coughing or straining. Plain radiographs of the affected hip showed no sign of hardware malposition, loosening, osteolysis, or other signs of failure (Fig. 2a and b). Owing to this presentation, she was referred to a general surgeon, who, with ultrasound, ruled out an occult inguinal hernia.

Five months later, she returned after a trial of physical therapy but was complaining of worsening pain and difficulty ambulating. Her left side remained asymptomatic. Laboratory tests were drawn, which revealed an erythrocyte sedimentation rate (ESR) of 51 mm/h (normal, <20 mm/h), C-reactive protein (CRP) of 27 mg/L (normal, <10 mg/L), serum cobalt (Co) level of 11.4 ppb (normal, <1 ppb), serum chromium (Cr) level of 1.5 ppb (normal, <1 ppb), and white blood cell count (WBC) of 5.7 × 10^3/μL (normal, 3.48-9.42 × 10^3/μL) with 21% lymphocytes and 70% neutrophils. Magnetic resonance imaging showed soft tissue swelling and a fluid collection near the femoral head of the right hip, in addition to joint space distention on proton density sequences, with no abnormal findings on the contralateral side (Fig. 3).

At this point, a diagnosis of MACC and ALTR was made, and she underwent revision THA. Intraoperatively, an extensive amount of necrotic-looking fibrous tissue was noted throughout the hip joint, and upon performing the capsulotomy, a thick, greenish, gelatinous material was encountered. Tissue was sent for frozen section, which demonstrated necrosis but no acute inflammation. There was also a moderate amount of typical black fretting/corrosion debris at the femoral head/neck taper junction and on the trunnion itself (Fig. 4a and b). The joint was thoroughly irrigated, the necrotic tissue was excised, the trunnion was thoroughly cleaned of corrosion debris, a modular titanium taper sleeve was placed, and her bearing surface was converted to ceramic-on-polyethylene material. Final pathology revealed acellular fibrinoid material, chronic inflammation, and necrosis. She rehabilitated from her revision well and had no postoperative complications.

Twenty-one months later, approximately 2 years after her left THA, she represented with similar symptoms in her left hip; the right hip was now asymptomatic. She reported increasing need for pain medication, difficulty ambulating, and the same anterior groin pain as she had on the right side before revision. Radiographs again showed no evidence of hardware failure and no evidence of calcar lysis (Fig. 5a-c). Laboratory results showed an ESR of 83 mm/h, CRP of 66.2 mg/L, serum Co level of 9.8 ppb, serum Cr level <1.0 ppb, and WBC of 8.2 × 10^3/μL with 15% lymphocytes and 76% neutrophils.

Owing to the nature of her symptoms and her laboratory results, a diagnosis of MACC was again made. A second magnetic resonance imaging was deemed unnecessary, and she again underwent a revision. Intraoperatively, we were prepared for abductor insufficiency, but none was noted. There was capsular swelling and a white creamy exudate within the joint capsule. There was also a

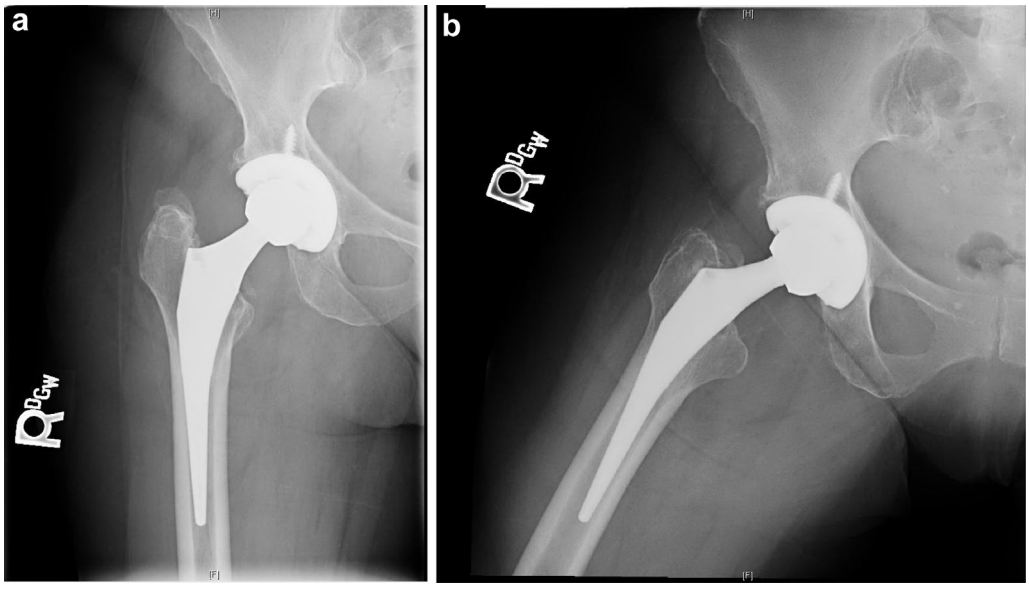

Figure 2. AP (a) and lateral (b) radiographs of the right hip upon presentation approximately 5 years after the initial right THA show no sign of complication.