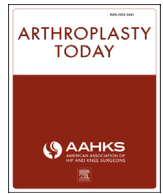




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Case report

Pseudotumor in ceramic-on-metal total hip arthroplasty

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ABSTRACT

The increasing demand for total hip arthroplasty (THA) in relatively young, high-demand patients has led to the use of hard-on-hard bearing surfaces. Adverse local tissue reaction/pseudotumor and elevated serum metal ion levels are commonly reported complications encountered in metal-on-metal THA, while audible articulation and rim fracture are reported in ceramic-on-ceramic THA. For this reason, ceramic-on-metal THA was implemented as an ideal hard-on-hard bearing combination. In this report, we describe a case of bilateral simultaneous ceramic-on-metal THA in a 69-year-old woman who presented 7 years postoperatively with unilateral hip pain associated with underlying pseudotumor and elevated serum cobalt and chromium ion levels. Pre-revision workup, intraoperative findings, and postoperative evaluation are included and suggest acetabular malposition as a potential source for complication.

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Introduction

Before the 21st century, metal-on-ultra-high-molecular-weight polyethylene bearing surfaces had been the preferred bearing couple for total hip arthroplasty (THA) [1]. Although primary THA outcomes were good to excellent, with >80% 25-year survivorship noted in some series, increased life expectancy coupled with younger, healthier, and higher-demand patients led to consideration of alternative THA bearing surfaces [2].

Alternative bearing combinations were developed or modified and included metal-on-metal (MoM), ceramic-on-ceramic (CoC), metal-on-highly-cross-linked polyethylene, and ceramic-on-highly-cross-linked polyethylene (CoXP). While MoM and CoC bearings are desirable due to markedly decreased wear rates, the former is associated with increased local/systemic metal ion levels and adverse local tissue reactions (ALTR), and the latter with

increased risk of head or liner fracture and audible noise generation. The often-insidious biologic effects of a MoM bearing include the development of ALTR, also referred to as adverse reaction to metal debris, which were originally histologically described as aseptic lymphocytic vasculitis-associated lesions [3]. These tissue reactions can manifest as an effusion, local tissue necrosis, periprosthetic osteolysis, or pseudotumor, which may be solid and/or cystic [4]. Histopathologically, pseudotumors are described as cell-mediated (type IV) hypersensitivity reactions characterized by perivascular lymphocytic infiltrate, fibrinous exudate, macrophage accumulation, and tissue necrosis [5]. Clinically, pseudotumors may present in a number of ways, including pain, presence of a palpable lump, skin changes/rash, spontaneous instability/dislocation, deep vein thrombosis, and/or neurologic examination changes due to underlying nerve palsy [6,7]. Given these associated complications, ALTR often leads to revision THA, and revision THA for ALTR have been reported to have worse outcomes when compared to revision THA for other causes [8].

With the potential complications of MoM and CoC bearings, ceramic-on-metal (CoM) THA was thought to represent an optimized combination of bearing surfaces without the added risk of ceramic fracture, acoustic noise, or the damaging effects of local/systemic elevated metal ion levels. However, metal ions are not normal following CoM THA, presumably secondary to by-products of mechanically assisted crevice corrosion at modular junction points, such as taper corrosion at the head-neck junction [9]. Cadossi et al [10] reported a series of 49 patients (20 CoM THA and

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Figure 1. Anteroposterior (AP) pelvis radiograph at time of presentation to our clinic (7 years s/p simultaneous bilateral CoM THA) without signs of osteolysis or loosening.

29 MoM THA) with an average of 3 years follow-up and noted that both chromium and cobalt levels were elevated postoperatively in both groups, although they were less elevated in the CoM group. Interestingly, despite the elevated metal ions found in the CoM THA population, there is a paucity of CoM cases involving ALTR reported in the literature. Unlike previous case reports with aseptic loosening, this case presents a patient with prior simultaneous bilateral CoM THA, unilateral symptoms, and ALTR without aseptic loosening of either the femoral or acetabular components [11,12].

Case history

A 69-year-old woman 7 years after simultaneous bilateral THAs initially presented to our clinic in August 2015. Symptoms included right worse than left lower back and gluteal pain for over 1 year. She experienced a popping sensation in her right hip. Radiographs demonstrated bilateral THAs with hard-on-hard bearings. Implant positioning appeared adequate, and there was no osteolysis or radiographic signs of loosening (Fig. 1). She had a body mass index (BMI) of 26.2 kg/m², walked with a normal gait (no Trendelenburg), demonstrated painless full range of motion of both hips, and had mild tenderness of bilateral greater trochanters. Her neurovascular examination was normal. Radiographs and magnetic resonance imaging (MRI) of her spine revealed degenerative scoliosis of the lumbar spine, facet arthropathy, and foraminal stenosis of L4-L5 and L5-S1. She continued with intermittent symptoms and returned in February 2016. A metal artifact reduction sequence/multi-acquisition variable-resonance image combination MRI of bilateral hips and serum cobalt and chromium ion levels were ordered. When the patient returned in August 2016, her pain had worsened and now included persistent right groin pain, which was associated with nontender, palpable swelling. A copy of the operative report, which was provided by the patient, revealed bilateral DePuy Pinnacle Sector II acetabular shells with Pinnacle cobalt-chrome (CoCr) inserts and DePuy Summit Stems with BioloX Delta ceramic heads (DePuy Synthes Joint Reconstruction, Warsaw, IN). The multi-acquisition variable-resonance image combination MRI

demonstrated atrophy of the right hip abductors with a large right hip effusion and extension of the fluid collection along the iliopsoas bursa measuring 11.6 cm × 3.0 cm (Fig. 2). A small left hip effusion was present as well. Serum cobalt and chromium levels (February 2016) were 24.4 and 19.2 ppb, respectively. Inflammatory markers were within normal limits with erythrocyte sedimentation rate 2 mm/h (normal <30 mm/h), C-reactive protein <0.1 mg/dL (normal 0.0–0.8 mg/dL), and interleukin 6 <5 pg/mL (normal <5 pg/mL).

A revision right THA was performed. Before exposure, an aspiration of the joint removed 10 mL of gray/green and cream-colored fluid consistent with discoloration from the presence of metal debris. The fluid was sent for cell count and culture. The gluteus medius and minimus tendons were intact. The pseudocapsule was thickened, gray and green in color, and excised along with surrounding scar tissue surrounding the femoral neck (Fig. 3). The ceramic head showed metal transfer but no corrosion was encountered on the trunnion (Fig. 4). The femoral component was in appropriate anteversion and confirmed to be well fixed. The acetabular cup was operatively in approximately 45° of inclination and 30°–35° of anteversion. We did not appreciate any evidence of corrosion or fretting between the metallic liner and titanium shell. After removal of the liner, the cup was confirmed to be well fixed. The pseudotumor was dissected along the iliopsoas tendon sheath and excised. Approximately 200 mL of green and cream-colored fluid under pressure drained from this cystic structure. A DePuy highly cross-linked +4-mm lateralized polyethylene liner for a 52-mm cup with an inner diameter of 36 mm was inserted. The trunnion was cleaned and dried, and a BioloX delta ceramic head, size 36 mm +1.5 with a titanium sleeve was installed. The hip was reduced and was stable with a Ranawat angle of approximately 60°.

The postoperative course was uneventful. Intraoperative cultures were negative for infection. Pathology report described the specimen

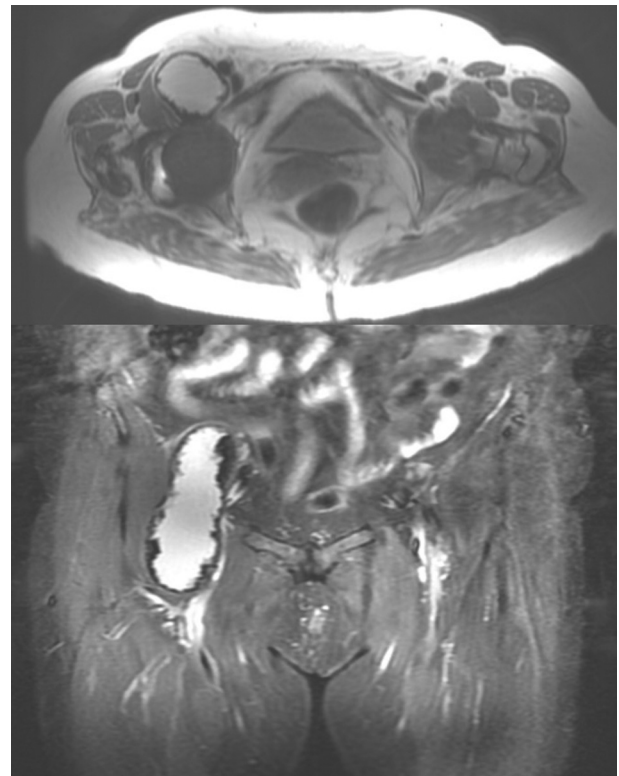


Figure 2. Axial (T1) and coronal (T2) metal suppression magnetic resonance images of patient now 7.5 years out from simultaneous bilateral CoM THA notable for unilateral (right) cystic lesion (T1 and T2 hyperintense, pseudocapsular disruption, tracking anteriorly/proximally).

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