

Case Report

Massive Femoral Osteolysis in Metal on Metal Total Hip Arthroplasty

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Abstract

Osteolysis is a well known complication of total hip arthroplasty. Generally, it is thought to occur most commonly in hips with polyethylene. We report on the case of a patient with massive proximal femoral osteolysis from a metal-on-metal (MOM) articulation. This case is unique given the extent of his osteolysis, stability of the components, and predominance of macrophages. The serum levels of chromium and cobalt were below what has previously been associated with massive osteolysis. Intraoperatively the components were found to be stable. The hip was revised to a metal on highly crosslinked polyethylene bearing leaving the femoral stem and acetabular cup in place. Bone grafting was performed around the proximal femur. This is the first case report to document osteolysis involving zones 1,2,6, and 7 of the proximal femur in a MOM total hip.

INTRODUCTION

While metal-on-metal (MOM) articulations have numerous advantages, recent literature has shown they are not without risk. As use increased in the past two decades, reports began emerging detailing novel complications. The most prominent is aseptic lymphocyte dominated vacuities-associated lesion (ALVAL). [1] Authors have also reported complications from metal hypersensitivity and concerns persist about the long-term effects of metal ions circulating in the body [1]. Painful metal-on-metal hips also created the new challenge of distinguishing between metallosis and infection.

Despite the theoretical avoidance of osteolysis, MOM articulations have not been immune to this complication. In general, osteolysis in MOM total hips affects the periacetabular region and the most proximal portions of the femur, most commonly in zone 1 as described by Gruen et al [2]. Furthermore, osteolysis is generally associated with extremely high levels of chromium and cobalt in the peripheral blood.

To our knowledge, extensive osteolysis of the proximal femur has not been reported. This case report discusses a patient who presented with massive osteolysis of the proximal femur 8 years after implantation of a well functioning MOM total hip arthroplasty. The lab values for metal ions were elevated but below those generally associated with osteolysis. In addition to the massive osteolysis, pathology showed a macrophage predominated response as opposed to the more typical lymphocytic response seen with MOM articulations. Institutional

review board approval was granted and the patient was notified and consented to this publication.

CASE REPORT

A 59 year old male (180cm;85kg; BMI=26.22) presented with osteoarthritis of his right hip in 2004. In February of that year, he underwent a right total hip arthroplasty utilizing a 15mm, six inch Solution stem, 36mm cobalt chrome head, 58mm Pinnacle cup, and metal liner (DePuyOrthopaedics; Warsaw, IN). The cup was placed in 42 degrees of abduction and 8 degrees of anterversion. He returned for his two week and six week postoperative appointments but was lost to follow-up for years after that. He was able to return to work as a heavy laborer and had no symptoms until six months prior to

PRESENTATION

At that time, the patient began to notice decreased mobility secondary to pain, especially with stairs or inclined surfaces. The patient also reported night pain, although he denied any groin pain. The patient continued to work without restrictions and reported no history of trauma of any sort to that extremity. The pain was reported to be in the thigh with activity and rest. Plain radiographs revealed massive osteolysis of the proximal femur (Figures 1&2). However, spot welding was noted distally on the radiographs and it was felt that his fully porous coated stem was still stable.

A work-up for infection was negative. A complete metabolic panel and a complete blood count were unremarkable with a



Figure 1 AP radiograph demonstrating massive femoral osteolysis.

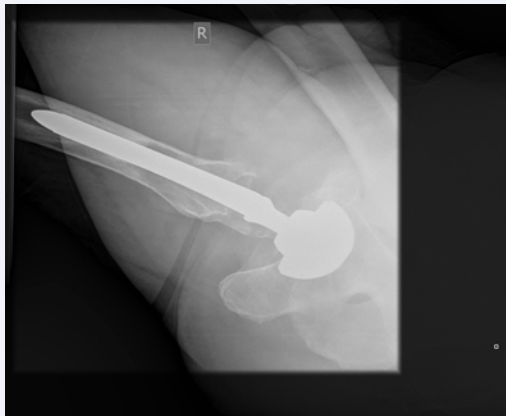


Figure 2 Lateral radiograph demonstrating massive femoral osteolysis.



Figure 3 Corrosion present at the junction of the head and trunnion.

white blood cell count of 5.7 K/uL. His erythrocyte sedimentation rate (ESR) and C - reactive protein (CRP) levels were within reference values. Metal ion levels from whole blood were sent to an outside laboratory and returned with an elevated chromium level of 7.5mcg/L (reference range ≤ 1.4) and a cobalt level of

12.5 mcg/L (reference range ≤ 1.8). The patient was afebrile with normal vital signs and denied any history of fevers or chills.

Following a thorough discussion of the various treatment options the patient decided to proceed with revision surgery. This occurred six months after his initial presentation to our clinic. Intraoperatively, three sets of tissue and fluid cultures were obtained. A ring of corrosion was noted at the junction of the trunnion and head (Figure 3) and can be seen in Figure 4 following removal. Massive osteolysis was present that seemed to be even more extensive than appreciated on the preoperative radiographs (Figure 5). The femoral head and metal acetabular liner were removed. Following thorough debridement and irrigation, the acetabular component and femoral stem were each tested independently to determine stability. There were no clinical signs of loosening in either component. A highly crosslinked polyethylene liner (Pinnacle ALTRX 60/36 +4mm; Depuy Orthopaedics Warsaw, IN) was inserted into the acetabular component and a compatible cobalt chrome head (Articulzeze



Figure 4 Corrosion after removal from the femoral stem.

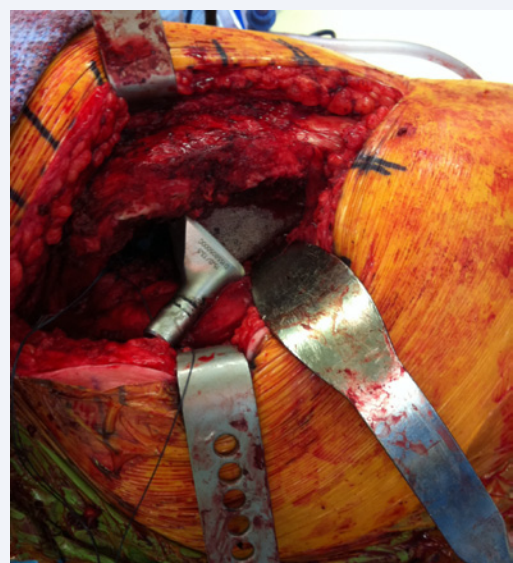


Figure 5 Extensive osteolysis noted during surgery.

36mm +5; Depuy Orthopaedics Warsaw, IN) was placed on the trunnion of the stable stem. Bone grafting was performed with crushed cancellous bone around the proximal femur.

DISCUSSION

Generally reactive lesions in MOM hips are related to lymphocytic response. Furthermore, MOM classically leads to soft tissue destruction more than destruction of bone. If femoral osteolysis does occur, it generally only involves Gruen zones 1 and 7 [2]. Our patient was unique in that his pathology showed an abundance of macrophages and the soft tissues were relatively uninvolved. In contrast, the extent of his osteolysis was massive with complete involvement of Gruen zones 1, 2, 6, and 7. Zones 3, 4, and 5 were felt to be uninvolved and given the extensively porous coated nature of the stem were sufficient to maintain stability.

Several publications in the peer-reviewed literature have reported on osteolysis in MOM hips, but none to the extent and nature of this case. Park et al published their findings retrospectively reviewing 165 patients with primary cementless MOM total hip arthroplasties [3]. In their review, 10 hips in nine patients showed osteolysis. These lesions were all localized to the greater trochanter. In their report, they noted perivascular accumulation of CD3-positive T-cells and CD68-positive macrophages but a notable absence of particle-laden macrophages and polymorphonuclear cells. These findings are in contrast to the pathology of the patient being reported which showed chronic inflammation and macrophages containing pigmented material. Furthermore, the extent of osteolysis in their report was always limited to the most proximal portion of the femur with no where near the distal extension of the patient presented in this case report. It is possible that the osteolysis noted in this patient was also partially in response to corrosion, and not only to the metal ions themselves. Urban et al as well as Lee et al have both reported on the relationship between corrosion particles and osteolysis. [4,5]. According to their work,

corrosion particles may serve as third-body wear particles and generate an inflammatory response which leads to osteolysis in vitro [6]. Given that corrosion was noted on the trunnion of our patient, this may have therefore been a confounding cause of the massive osteolysis observed in our patient. Huber et al reported on postmortem analysis of femoral osteolysis from MOM articulations in 2010 [7]. Nine total hips in seven patients with MOM hips were reviewed. All patients had a Zweymuller SL stem, Alloclassic cup, and Metasul metal-on-metal liner. At the time of their passing, all but one patient were asymptomatic from their femoral osteolysis. Their histologic evaluation of the joint capsule showed a lymphocytic response in all but one hip. Furthermore, they did note that the necrotic layer of the capsule was generally demarcated by metal particle-laden macrophages, similar to what was seen in the pathologic sections of our patient.

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