Chronic Expanding Hematoma After Metal-on-Metal Total Hip Arthroplasty

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Abstract

A 76-year-old woman who underwent bilateral metal-on-metal total hip arthroplasty fell 3 years after this procedure and subsequently incurred continuous pain in her buttock. Plain radiographs showed no fracture and no loosening of the hip prosthesis. Magnetic resonance imaging revealed an abnormal, large, thick-walled mass with heterogeneous signal intensity at the right buttock. The prerevision diagnosis was adverse reaction to metal debris. The mass was surgically resected, and the metal femoral head was replaced by a dual-mobility prosthesis. Transcatheter arterial embolization was performed 2 days postoperatively. The hematoma was reduced and was not present after 9 months. The diagnosis of a periprosthetic soft tissue mass after metal-on-metal total hip arthroplasty should be carefully reached with magnetic resonance imaging and assessment of blood metal ion concentrations. Embolization is useful for the management of an expanding hematoma. [Orthopedics. 201x; xx(x):xx-xx.]

Metal-on-metal total hip arthroplasty (MoM THA) was introduced with the expectation of reducing the wear rate and enhancing the resultant durability of the articular bearing. However, during the past decade, there have been several concerns associated with MoM articulation. Adverse reaction to metal debris (ARMD), pseudotumor, and aseptic lymphocytic vasculitis-associated lesions have been reported. The occurrence of symptomatic, reactive periprosthetic soft tissue masses is a major concern after MoM THA. A pseudotumor has been defined as a solid or fluid mass in the periprosthetic soft tissue that may cause pain, swelling, and extensive soft tissue damage. The causes of painful periprosthetic masses after THA include not only metal debris but also polyethylene wear debris, infection, expanding hematoma, tumor, and synovial cysts. In 1980, Reid et al first reported the chronic expanding hematoma, which has dense fibrous tissue at the periphery with a central mass of bloody granulation tissue. The lesion slowly enlarges for more than 1 month after THA. Several cases of chronic expanding hematomas have been reported after failed THA. However, to the authors’ knowledge, this is the first report...
A 76-year-old woman had been diagnosed with bilateral hip osteoarthritis and underwent staged bilateral MoM THA with the M2a-Magnum Large Metal Articulation device (Zimmer Biomet, Warsaw, Indiana) in 2011. She fell and broke her right radius in April 2014. Three months later, she reported pain in her right buttock and was referred to the authors’ hospital. Plain radiographs of the pelvis showed no fractures (Figure 1A). The right buttock pain continued for 1 year. Plain radiographs of the pelvis obtained in July 2015 showed an increase of soft tissue density around the right hip (Figure 1B). No loosening or migration of the hip prosthesis was observed. Magnetic resonance imaging (MRI) revealed an abnormal, thick-walled mass with heterogeneous signal intensity at the right buttock. This was considered type III according to the Hauptfleisch classification and grade C2 according to the Anderson classification (Figures 1C-E).

The results of laboratory tests before revision were as follows: hemoglobin, 9.2 g/dL; hematocrit, 31%; red blood cell count, 3.7×10⁶/µL; platelet count, 1.5×10⁵/µL; white blood cell count, 6.0×10⁹/µL (neutrophils, 76%; lymphocytes and lymphoblasts, 12%; monocytes, 7%; and eosinocytes, 5%); prothrombin time, 11.8 seconds; prothrombin activity, 111%; activated partial thromboplastin time, 30.3 seconds; and C-reactive protein, 0.8 mg/dL. Liver enzymes and kidney function had normal results. C-reactive protein indicated inflammation. The specific cause of the inflammation was undefined, but the patient had anemia possibly due to crypto-inflammation. She did not take anticoagulants or antiplatelet agents. Metal ion concentrations in the blood were not measured because this was not covered by her health insurance. Bloody joint fluid (2.8 mL) was aspirated. Because no bacterium was detected on culture, infection was excluded from the differential diagnosis. The authors reached the preoperative diagnosis of pseudotumor associated with ARMD after MoM THA. They resected the pseudotumor in September 2015.

Intraoperatively, a large mass of clotted blood weighing 183 g was observed in the thick capsule and was resected as much as possible. The trunnion of the femoral stem was intact. The large metal head was replaced with the Active Articulation Dual Mobility Hip System (Zimmer Biomet) to prevent the occurrence of pseudotumor related to metal debris. Whole blood and effusion around the hematoma were collected during surgery, and cobalt ion concentrations of these specimens were measured later with the use of inductively coupled plasma mass spectrometry as previously reported. Because slight bleeding was still present and continuous, 2 g of tranexamic acid was administered intravenously.

Two days postoperatively, angiography was performed. It revealed that hypervascularity around the remaining capsule of the mass involved the lateral femoral circumflex artery, superior gluteal artery, inferior gluteal artery, and iliolumbar artery (Figure 2A, Video 1). To prevent the recurrence of hematoma, transcatheter arterial embolization was performed for the branches of these arteries. The lower contrast image of the periprosthetic tissue confirmed that embolization had been successful (Figure 2B, Video 2). Cobalt ion concentrations of blood and joint fluid collected intraoperatively were 1.9 µg/L and 1.3 µg/L, respectively. Light microscopic examination of the stained tissue sections (Figure 3) revealed blood cells and numerous fibrin clots within a highly vascular, degenerative synovial tissue matrix. The histological diagnosis was hematoma.

Figure 1: Preoperative anteroposterior radiographs of the pelvis 3 months (A) and 1 year (B) after falling. Coronal T2-weighted short-T1 inversion recovery magnetic resonance imaging of the pelvis (C). Axial T1-weighted (D) and T2-weighted (E) magnetic resonance imaging of the right hip.

Figure 2: Angiography images before (A) and after (B) transcatheter arterial embolization.
Two weeks postoperatively, the hip pain had stopped and the C-reactive protein level was normal. Magnetic resonance imaging showed a small, cystic periprosthetic mass at 3 months postoperatively, which had disappeared by 9 months after embolization.

**Discussion**

The occurrence of a periprosthetic soft tissue mass is a major concern after MoM THA, with most such reported masses having been diagnosed as ARMD.²⁻⁴⁻⁷⁻⁸ The current case was unusual in that the mass was diagnosed to be an expanding hematoma. Chronic expanding hematomas are rare. Goddard et al⁶ described a case of an expanding hematoma after failed THA. They reported that trauma, including surgical trauma, had been implicated as the cause of many of the reported expanding hematomas. In the current case, the hip prosthesis was considered to be stable based on the findings of plain radiographs. Falling may have caused the expanding hematoma. To the authors’ knowledge, this is the first report of a chronic expanding hematoma after MoM THA.

Magnetic resonance imaging has been used to grade the severity of soft tissue masses associated with MoM THA.⁷⁻⁸ Grade C2 of the Anderson⁸ classification involves a large, cystic mass (>5 cm) with a thick wall and mild progressive disease. This mass occasionally damages the surrounding muscles as it progresses to grade C3. Magnetic resonance imaging revealed a large, cystic, heterogeneous mass with a thick wall in the current case. The authors thought that the mass was about to progress to grade C3 and therefore required prompt treatment, including revision surgery. The authors misdiagnosed this case as ARMD preoperatively based on the MRI findings; they later changed their diagnosis to an expanding hematoma. The specific MRI finding indicating an expanding hematoma was the overall heterogeneous signal intensity in the soft tissue mass, unlike the homogeneous cystic mass that has been reported with ARMD.⁷⁻⁸

Some studies have shown an association between blood cobalt and chromium ion concentrations and increased failure, which is seen as wear, after MoM hip replacement.¹⁰⁻¹¹ The British Medicines and Healthcare products Regulatory Agency issued a medical device alert for all MoM articulations, suggesting follow-up using metal artifact reduction, sequence MRI, and blood metal ion per billion for ARMD in MoM THA.¹² In the current case, the authors could not measure the preoperative metal ion concentrations in the blood because this was not covered by the patient’s health insurance. The metal ion concentrations of whole blood and effusion around the hematoma were assessed. The authors found an average cobalt ion level after MoM THA with the M2a-Magnum Large Metal Articulation device similar to that previously reported.⁹ If they could have assessed the metal ion level in the blood preoperatively, a result such as this would have caused the authors to reconsider the differential diagnosis.

Surgical resection is the primary treatment for an expanding hematoma,¹³ as a large mass will cause hip pain. Active bleeding is continuous in some expanding hematomas, and embolization using a gelatin sponge or microcoils has been effective in such cases.¹⁴⁻¹⁵ The expanding hematoma must be correctly diagnosed. Preoperative embolization will reduce intraoperative bleeding. As shown in the current case, postoperative embolization is effective for preventing the recurrence of an expanding hematoma.

**Conclusion**

The diagnosis of a periprosthetic soft tissue mass after MoM THA should be carefully reached with MRI and assessment of blood metal ion concentrations. Expanding hematoma should be considered a potential diagnosis if metal ion concentrations are not increasing and MRI reveals a heterogeneous lesion. Embolization is useful for the management of an expanding hematoma.

**References**


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Case Report


