

Vaginal mass following uncemented total hip arthroplasty

Young-Soo Shin, Tae-Wan Jung, Seung-Beom Han

ABSTRACT

A 53-year-old woman developed a vaginal mass following an uncemented total hip arthroplasty. The mass was in direct communication with the hip through an acetabular medial wall defect after loosening of the acetabular component. The mass formation was caused simultaneously by changes secondary to polyethylene wear, a tiny delamination of the porous titanium mesh coating and a broken antirotational tab on the acetabular cup, all of which may have served as sources of metal particles. A careful evaluation of the patient's history, symptoms, X-ray findings and computed tomography scans should always be performed to ensure accurate diagnosis.

Key words: Metal debris, polyethylene wear, pseudotumor, total hip arthroplasty

MeSH terms: Metallurgy, complications, hip replacement, hip prosthesis

INTRODUCTION

The present report describes the diagnosis and treatment of pseudotumor which caused a vaginal mass, dyspareunia and hip joint pain. The etiology of this pseudotumor has not been established. Potential causes of pseudotumors may include foreign-body reaction (caused by polyethylene wear or metal debris) and hypersensitivity (caused by metal debris). An important finding in our case is the development of pseudotumors caused simultaneously by foreign body reactions to polyethylene wear and metal debris.

CASE REPORT

A 53-year-old woman presented to her gynecologist in different institution with a vaginal mass, dyspareunia and painful osteoarthritis of her left hip in July 2012. She had undergone an uncemented total hip arthroplasty in January 1995 at our institution for secondary osteoarthritis due secondary to hip dysplasia (Crowe Type I). An uncemented

Harris multilock acetabulum (titanium, second generation Harris Galante II; Zimmer, Warsaw, Ind., USA) with polyethylene liner and an uncemented multilock femoral component 28-mm metal (cobalt chrome) head with a posterolateral approach was used.

On physical examination, her gait was normal. Mild discomfort was elicited only on extremes of motion. A mildly tender lump was found to be medially displacing the vaginal wall on per vaginal examination.

Plain radiographs of her left hip demonstrated loosening of the acetabular component and eccentric wear of the polyethylene liner. The femoral stem was well-fixed [Figure 1]. Computed tomography (CT) showed a large lobulated cyst inside the left ilium [Figure 2]. Magnetic resonance imaging was also performed and demonstrated a heterogeneous mass (dimensions: 3.0 cm × 5.4 cm × 6.1 cm) between the left acetabulum and obturator internus muscle. A collection of high signals on T2-weighted images with a rim of low signal intensity was noted. The results of serologic tests were within normal limits.

The decision was made to revise the prosthesis and decompress the cyst. Intraoperatively, a 5-cm-long, turbid fluid-filled cyst was found to be in direct communication with the hip joint. The cyst wall was thick and yellowish. The acetabular component was loose without gross metallosis, and its antirotational tab was broken down. The acetabular cavity was lined with gray necrotic tissue. After excision of the gray necrotic tissue, a large anterosuperior rim defect and 4 cm × 3 cm medial wall defect in the acetabulum were noted [Figure 3]. The contents of the cyst were aspirated and curetted out through the acetabular medial wall defect. We could not perform resection of the whole cyst wall due to its

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Figure 1: Plain radiographs of her pelvis with both hip joints showing loosening of the left acetabular component and eccentric wear of the polyethylene liner. The femoral stem was well-fixed

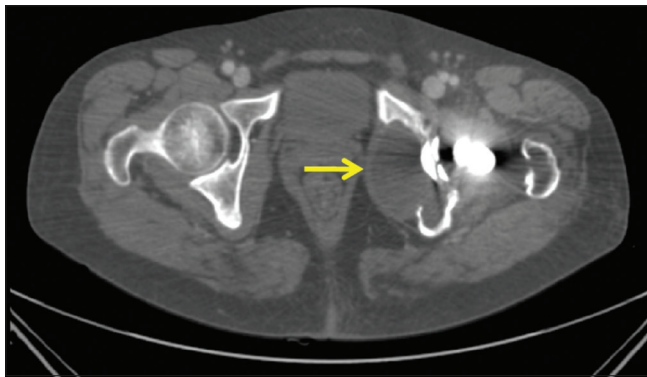


Figure 2: Computed tomography scan showing a large fluid filled mass (arrow) of soft tissue in the left intrapelvic region

adhesion to the hip, and therefore, we reduced the volume as much as possible. Aspiration of the left hip joint yielded a turbid fluid that contained a measurable concentration of metal ions. The reference values for serum cobalt (Co) and chromium (Cr) ion levels in normal control subjects without any metallic implants (Co 0.15 µg/L; Cr 0.26 µg/L) have been previously reported.¹ Ion concentrations were not significantly elevated (Co, 0.5 µg/L; Cr, 0.1 µg/L) in our patient. Histopathologic findings of the necrotic soft tissue showed infiltration of mostly foamy macrophages with some lymphocytes [Figure 4].

The acetabulum was reconstructed using structural bone grafts after reaming the bone deficient areas and a 58-mm trabecular metal cup was inserted with three screws. A highly cross-linked polyethylene liner was placed. A 28-mm-long metal head was placed. After the necrotic tissue was curetted, the proximal part of the stem was filled with morselized allografts, and stability was confirmed. At a followup examination conducted 6 months later, the patient was asymptomatic, with all components appearing well-fixed on repeat CT.

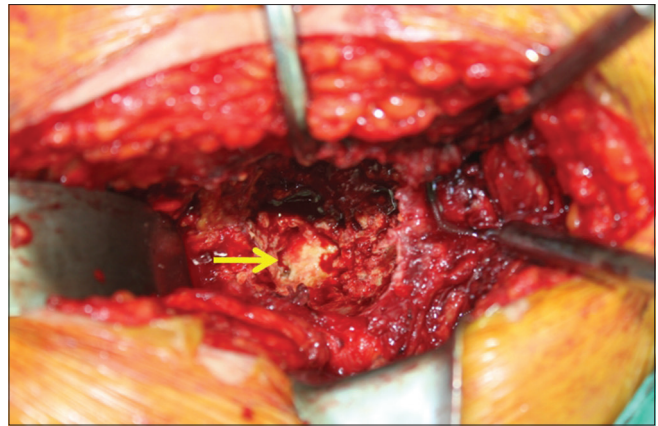


Figure 3: Peroperative photograph showing acetabular medial wall defect lined with gray necrotic tissue (arrow)

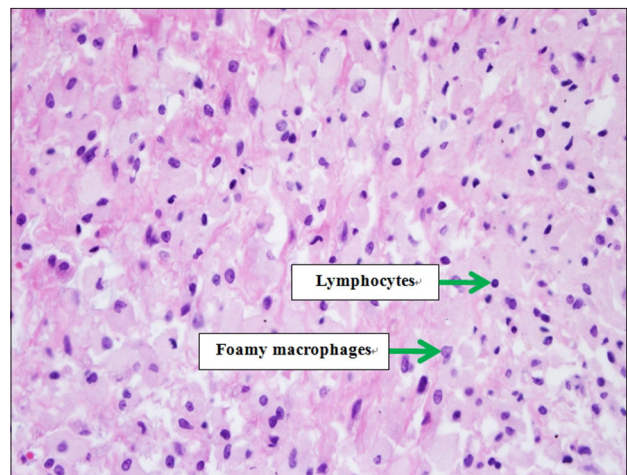


Figure 4: A histopathological detail of the same section showing infiltration of mostly foamy macrophages and admixed with some lymphocytes around necrotic tissue (arrow) (x400)

DISCUSSION

Pseudotumors may be caused by foreign-body reactions to methyl methacrylate, polyethylene, or metal adjacent to a total joint implant.² Polyethylene wear debris is taken up by macrophages, which release prostaglandin E₂. This can cause increased secretion of synovial fluid (induced by foreign-body reaction to polyethylene debris or mechanical loosening of the cup into the pelvis), resulting in a pelvic mass. These findings are similar to those in the CT study by Hattrup *et al.*³ who reported a case in which an intrapelvic cyst had developed following total hip arthroplasty with cement, resulting in vesical compression. The patient in that case report had defects in the medial wall of the acetabulum, and the pelvic foreign-body granuloma communicated with the hip through the acetabular medial wall defect. However, the results of that study could not accurately reflect the differences between foreign-body reactions caused by methyl methacrylate, polyethylene wear, or metal debris, because the patient in that study

appeared only to have a reaction to the loose methyl methacrylate fragments. In the current study, we showed that polyethylene wear, a tiny delamination of the porous titanium mesh coating on the acetabular shell, and a broken antirotational tab was present on uncemented total hip arthroplasty.

Pseudotumors may occur around implants with low wear, likely because of a metal hypersensitivity reaction. Fischer *et al.*⁴ described a case in which a patient suffered sciatic neuropathy as the result of a large compressive pelvic mass. A histological analysis showed the presence of titanium, polyethylene, and methyl methacrylate particles in the soft tissues. However, their study only described titanium deposits and polyethylene particles using a polarizing microscope without mentioning hypersensitivity caused by metal debris. In the current study, we described foreign-body reaction (caused by polyethylene wear or metal debris) by using histopathologic findings of the necrotic soft tissue with an aseptic lymphocytic vasculitis-associated lesions (ALVAL) score and aspiration with metal ion concentrations. We examined synovial lining integrity, inflammatory cell infiltrates, and tissue organization, necrosis, and metal wear particles of pseudotumor-like tissues to rule out metal hypersensitivity reactions. Our case showed lower metal ion concentrations in the joint fluid and soft tissue, and typical histologic features of suspected wear, and received an ALVAL score of 6 (3 for synovial lining, 1 for inflammatory infiltrate, and 2 for tissue organization).⁵ The presence of extensive necrosis and a number of macrophage infiltrates seen histologically would be considered a metal-induced cytotoxic effect. Dose-dependent cytotoxicity of clinically relevant cobalt nanoparticles on macrophages *in vitro* has been recently reported.⁶ Metal debris cytotoxicity might be an important biological reaction involved in pseudotumors. Doorn *et al.*⁷ reported important differences in the cellular effects of metal particles versus metal ions. Particles cause a foreign-body response via an interaction with macrophages. Therefore, we have suggested that metal debris cytotoxicity rather than hypersensitivity was the cause of the pseudotumor in our case.

In addition, our study shows that the decreased acetabular inclination, which can lead to impingement and subluxation

of the femoral head and excess wear thereby generating a large amount of metal debris which is one of the most important factors in the generation of pseudotumors. Other possibilities we could speak that female who has smaller acetabular components is more likely to lead to the formation of a thinner fluid film between the articulating surfaces. It can be more susceptible to increased wear developing pseudotumors.

The present study is the best of our knowledge, the first case of the pseudotumor formation simultaneously due to polyethylene wear, a tiny delamination of the porous titanium mesh coating and a broken antirotational tab on the acetabular cup, which can be a source of metal particles. A careful evaluation of the patient's history, symptoms, X-ray findings and CT scans should be always performed to ensure accurate diagnosis.

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