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CLINICAL VIGNETTE

Arthroplasty-Related Necrotic Granulomatous Pseudotumor

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Introduction

Hip arthroplasty can rarely be complicated by the formation of a soft tissue mass close to the joint prosthesis. The mass is neither malignant nor infective in nature; therefore, the term 'pseudotumor.'¹ Much of the evidence suggests that particle of metal, polyethylene, or cement released by mechanical wear induces an aberrant inflammatory response, the extreme form of which manifests as granulomatous pseudotumor.² The clinical characterization of these pseudotumors remains poorly defined. Here are two patients who presented with these pseudotumors following total hip replacement.

Case 1

A 75-year-old man presented with right hip pain three years after undergoing total right hip metal-on-metal arthroplasty for severe osteoarthritis. Two years after the initial surgery, he had a revision for dislocating hip arthroplasty. The patient had been well until approximately 3 months prior when he started complaining of severe pain in the right hip without clicking, squeaking, or grinding. He reported no fevers, chills, loss of appetite, or unexplained weight loss. The patient's medical history included gout, hypertension, and prostate cancer. He had no known medication allergies. Medications included hydrochlorothiazide and allopurinol. He was married and worked in a warehouse. He drank alcohol occasionally and did not smoke or use illicit drugs. Laboratory tests included: hemoglobin 12.0 g/dL, white blood cells 4200/mm³, erythrocyte sedimentation rate 98 mm/h, and C-reactive protein 11 mg/dL.

A plain radiograph of the right hip showed a perihardware soft tissue mass (Figure 1A). Magnetic resonance imaging (MRI) scans of the right hip with short-tau inversion recovery (STIR) parameters (Figure 1B) demonstrated a large periprosthetic fluid collection centered in the peritrochanteric soft tissues, communicating with the joint posteriorly. The fluid collection had an irregular thick wall and measured 21 cm in craniocaudad by 10.6 cm in anteroposterior by 10.6 cm in transverse dimension. The fluid sensitive sequences showed an irregular thickened and nodular rind around the fluid collection, with multiple punctate areas of low signal intensity, suspicious for areas of metallosis. Ultrasound-guided aspiration of the periprosthetic collection of the right lateral thigh yielded 450 mL of dark straw-colored fluid, which did not grow any organism on routine cultures.

His symptoms of severe hip pain, large fluid collection on imaging, and raised acute phase reactants were worrisome for an infectious process; and therefore, removal of right total hip

arthroplasty with placement of antibiotic spacer was performed. Histological examination showed completely necrotic fibroadipose tissue and osteonecrosis. Focal patchy infiltrate of lymphocytes, histiocytes, and eosinophils with scattered granulomatous inflammation was present but no evidence of infection (Figure 1C). Methenamine silver and acid-fast bacillus stains were negative for fungal organisms and acid-fast bacilli. At 24-month follow up, the patient continues to do well with his revised hip replacement.

Case 2

A 74-year-old man was seen in the orthopedic clinic with pain in the right hip and a large periacetabular lesion. Three years prior, he underwent total right hip metal-on-polyethylene arthroplasty for severe osteoarthritis. He had been well until 6 months earlier when he developed right hip pain that was initially intermittent but became constant. He had no fever, night sweats, or change in appetite or weight. He worked at a golf club and denied tobacco and alcohol use. On examination, range of motion of the right hip was restricted with 70 degrees flexion, 20 degrees external rotation, and 20 degrees abduction.

Erythrocyte sedimentation rate was 50 mm/h (reference range, <60), C-reactive protein was 8.8 mg/dL (reference range, <1.0). Complete blood count and results of renal- and liver- function tests were normal. A plain radiograph of the right hip showed a perihardware soft tissue mass and prominent periprosthetic lucency within the greater trochanter along the proximal lateral aspect of the femoral stem (Figure 2A). A bone scan showed a large area of decreased radiotracer uptake in the right hip region with some peripheral accentuation of activity (Figure 2B). Computed tomography (CT) of the pelvis revealed a large periprosthetic soft tissue density (Figure 2C).

Ultrasound-guided core and fine-needle aspiration biopsies of the right hip mass/pseudotumor was performed. Pathology revealed extensively necrotic 'ghost' histiocytic and giant cells granulomatous reaction with rare black degenerate particulate compatible with necrotic granulomatous pseudotumor (figure 2D). The pain spontaneously subsided three months later, so it was deemed unnecessary to pursue a revision surgery. He was followed clinically and with serial ultrasound imaging every 6 to 12 months. He remained asymptomatic after a follow-up period of four years.

Discussion

Pseudotumors occurring after hip arthroplasties have been rarely described. The majority followed metal-on-metal hip resurfacings. Pandit et al¹ estimated that approximately 1% of patients who have a metal-on-metal hip resurfacing develop a pseudotumor within five years. In a single-surgeon consecutive series of 670 metal-on-metal hip resurfacings, two pseudotumors have been found.³

The first case was a large painful synovial cyst in the thigh, which communicates with the hip joint. There was no evidence of metallic wear in either bone or surrounding fibroadipose tissue histology. The iliopsoas bursa is the largest bursa in the body that overlies the hip joint capsule posterior to the iliopsoas tendon and lateral to the femoral vessels. Communication between the iliopsoas bursa and the hip joint is present in 15% of normal hip joints.⁴ Increased intra-articular pressure takes the path of least resistance into the iliopsoas bursa with secondary accumulation of the synovial fluid. The bursa may enlarge, dissect its way between muscle groups and extend proximally into the pelvis, anteriorly in the groin, or laterally in the lateral aspect of the thigh.⁵

The second patient presented with a symptomatic tumor-like mass with obvious features of wear debris on histology. The exact cause of these pseudotumors is not well defined. Minute particles of wear debris released within the joint space are responsible of an inflammatory response, the extreme form manifesting as a granulomatous pseudotumor.² These particles may induce the production of factors such as RANKL that increase osteoclastogenesis, resulting in increased bone resorption of the surrounding bone.⁶

In the cases reported to date, pseudotumors presented in a number of ways, such as pain, spontaneous dislocation, nerve palsy, femoral vein thrombosis, and a palpable mass.¹ Ultrasonography, MRI, and CT scanning may all be used to detect the mass.¹ Both our patients presented with hip pain within 3 years post-operatively accompanied with raised acute phase reactants.

These pseudotumors may be confused with a malignant process, particularly in the presence of atypical clinicoradiologic features; therefore, a biopsy is often required to establish an accurate diagnosis.⁷ Histology of the mass typically reveals large sheets of giant cells and histiocytes, extensive necrosis and 'ghosts' of spindle cells. A diffuse or scattered, aseptic lymphocytic infiltrate frequently centered around the vessels may also be present.⁷

One study⁸ reported that at least 70% of metal-on-metal hip resurfacing patients presenting with an inflammatory pseudotumour will have a revision. The outcome of these revisions is poor with nearly half having major complications and a third required further revision within a few years. Recurrent pseudotumour has been found in three of the five hips requiring further revision.⁸

In conclusion, it is crucial to accurately differentiate these arthroplasty-related pseudotumors from infection or

malignancy. This can be achieved by a careful clinical evaluation, imaging and histological correlation.

Figure legends

Figure 1. An anteroposterior radiograph of the right hip 3 years after a metal-on-metal arthroplasty with a constrained acetabular liner reveals a perihardware soft tissue mass (panel A, arrows). A magnetic resonance imaging (MRI) obtained with coronal and axial short-tau inversion recovery (STIR) sequences shows a large periprosthetic fluid collection communicating with the joint posteriorly (panel B, arrows). Low-powered (40X) and high-powered (100X) representative microphotographs from the right hip lesion bone biopsy demonstrate focal marrow infiltrate of lymphocytes, histiocytes, and eosinophils with scattered granulomatous inflammation (panel C) (hematoxylin and eosin).

Figure 1A.

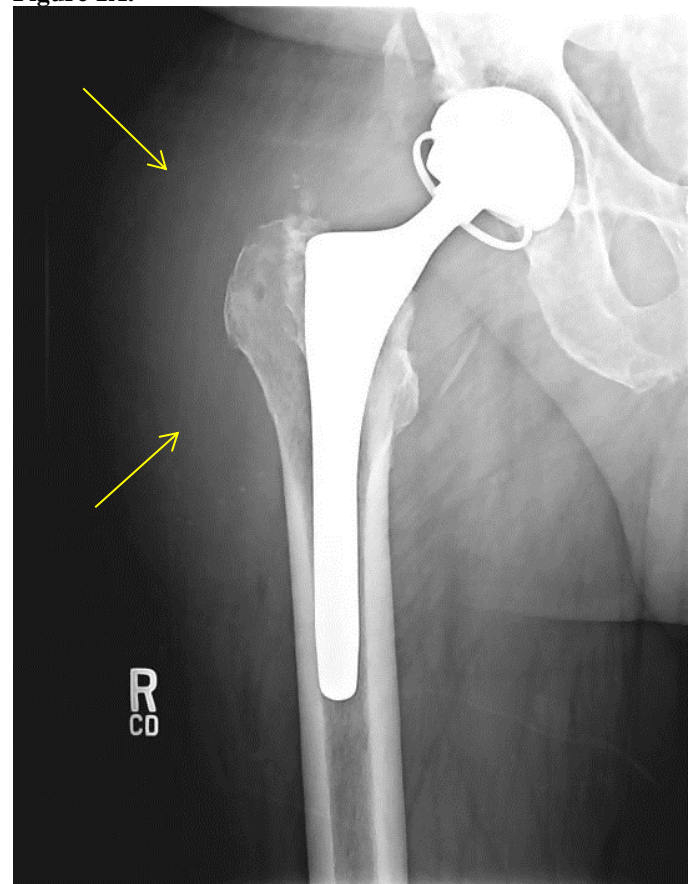


Figure 1B.

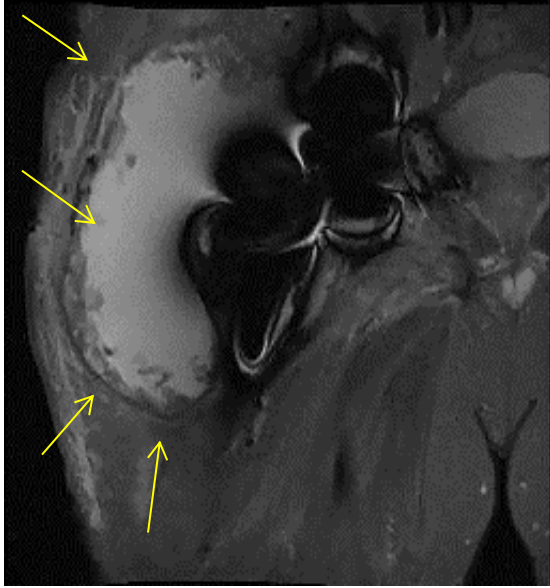


Figure 1C.

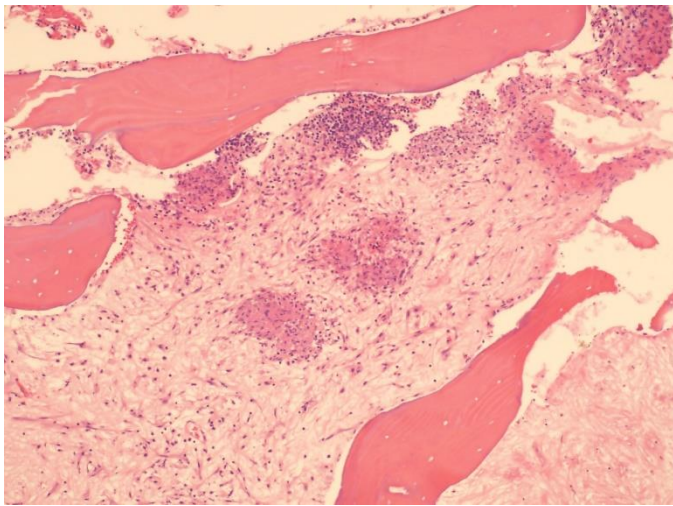
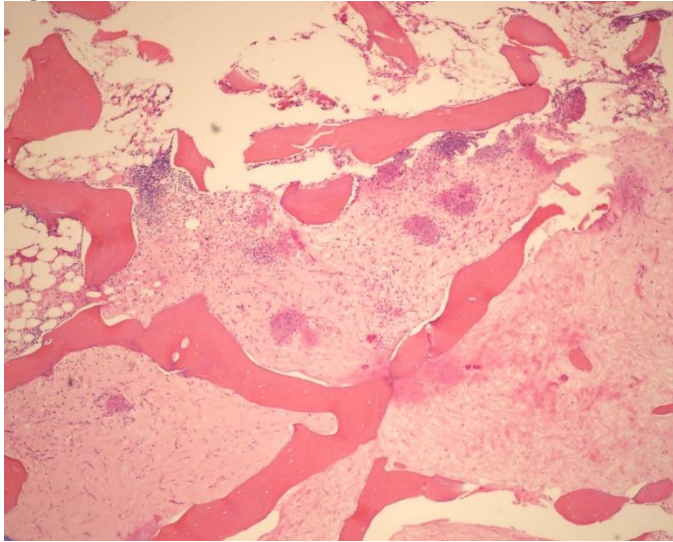


Figure 2. An anteroposterior radiograph of the right hip shows a metal-on-polyethylene total hip replacement and a perihardware soft tissue mass (panel A, arrows). A bone scintigraphy (panel B, arrows) and a computed tomography

(CT) scan (panel C, arrows) also show a large periprosthetic soft tissue mass. Histological examination of the right hip pseudotumor (panel D, hematoxylin and eosin) shows black degenerate particulate from the polyethylene component.

Figure 2A.

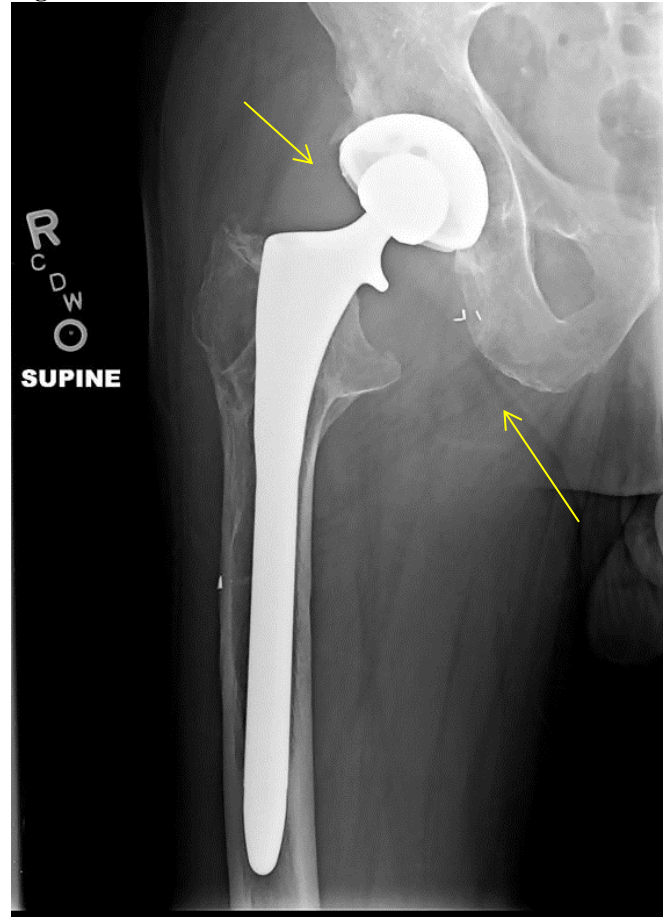


Figure 2B.

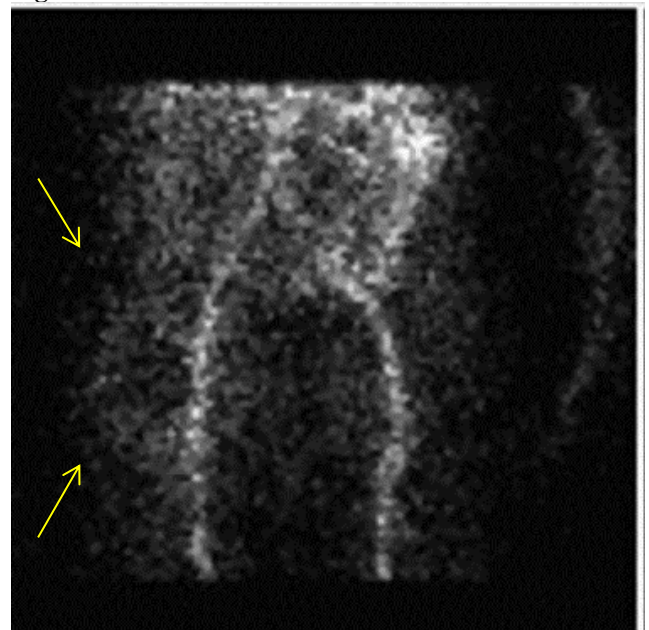


Figure 2C.

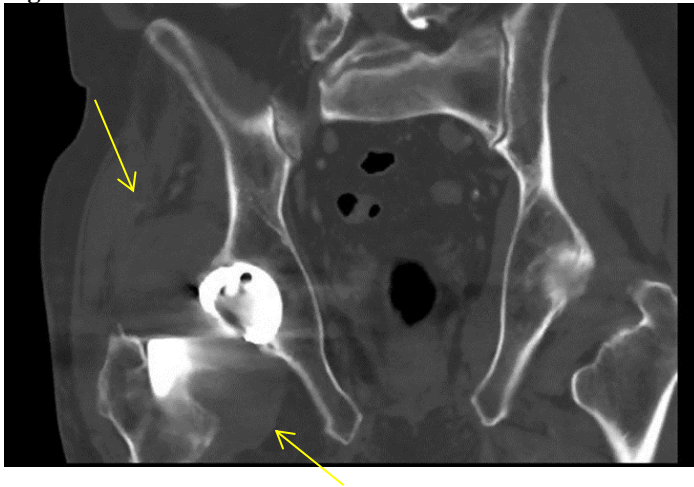
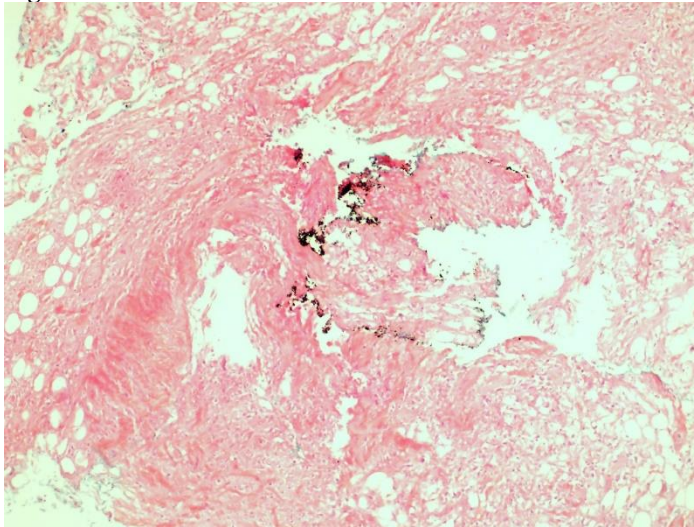


Figure 2D.



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