

Infected Pseudotumor in Total Hip Arthroplasty with Metal-on-Metal Friction Couple

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ABSTRACT

Total hip arthroplasty (THA) is the main treatment for advanced hip osteoarthritis and its complications include dislocation, infection, aseptic loosening and, to a lesser extent, adverse reactions to metal. Pseudotumor is a rare complication of THA with a metal-on-metal friction couple; its diagnosis and treatment are extremely important to reduce morbidity and mortality. We present the case of a 63-year-old male patient with a 13-year history of THA with a metal-on-metal friction couple who, at the time of consultation, presented a large palpable mass in the right gluteus and paresthesias in the homolateral sciatic nerve. The diagnosis of an infected pseudotumor was reached and treated with hip revision and antibiotic therapy.

Keywords: pseudotumor; total hip arthroplasty; metal-on-metal friction couple.

Level of Evidence: IV

Seudotumor infectado en un paciente con artroplastia de cadera con par de fricción metal-metal

RESUMEN

La artroplastia total de cadera es el principal tratamiento para la artrosis avanzada de cadera y las complicaciones pueden ser luxación, infección, aflojamiento aséptico y, en menor medida, reacciones adversas al metal. El seudotumor es una complicación poco frecuente con un par de fricción metal-metal. El diagnóstico y el tratamiento correctos son muy importantes para disminuir la morbimortalidad. Presentamos el caso de un hombre de 63 años que había sido sometido a una artroplastia total de cadera con un par de fricción metal-metal, 13 años atrás. Al consultar, tenía una gran masa en el glúteo derecho y parestesias en el territorio ciático homolateral. Se diagnosticó seudotumor asociado a infección periprotésica y el tratamiento definitivo consistió en revisión en un tiempo y la administración de antibióticos.

Palabras clave: Seudotumor; artroplastia de cadera; par de fricción metal-metal.

Nivel de Evidencia: IV

INTRODUCTION

Total hip arthroplasty (THA) has been the treatment of choice for severe hip osteoarthritis in recent decades.¹ The most frequent complications are dislocation, aseptic loosening, infections and, to a lesser extent, adverse reactions to the metal, such as pseudotumors.² 'Pseudotumor' is defined as a non-neoplastic periarticular mass caused by an immunological hypersensitivity response to metallic particles.³ Its prevalence after THA with metal-on-metal bearings ranges between 1% and 4%,³ although a rate of up to 41% has been reported, mostly asymptomatic pseudotumors.⁴ In 32% of cases, it can manifest with groin pain, paresthesia, limping or a palpable mass, along with various complications due to compression on neurovascular and urinary structures.⁵ Complementary studies to reach the diagnosis include ultrasound, computed tomography, magnetic resonance, and ionogram. Currently, different treatment algorithms are available that vary according to the clinical condition and electrolyte level.

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CLINICAL CASE

A 63-year-old man, rural worker, with no relevant clinical history. In 2007, he had undergone a cementless right THA with metal-to-metal bearings for the treatment of hip osteoarthritis. In 2014, he consulted another institution due to a painless tumor in the right gluteal region that had developed for two months, associated with paresthesia in the ipsilateral lower limb after several hours of sitting. A puncture biopsy was performed and, in the sample, *Staphylococcus caprae* was isolated, for which he was prescribed oral trimethoprim-sulfamethoxazole for 14 days. The sample from a new puncture biopsy at the end of treatment was negative.

As the symptoms had become more acute, including the tumor in the right glute, the patient consulted our institution in 2018. A physical evaluation was performed (Figure 1), and laboratory tests (Table), radiographs (Figure 2), a CT scan (Figure 3), and a puncture were requested, in which 1800 ml of seropurulent fluid were extracted (Figure 1). The culture was positive for oxacillin-susceptible *Staphylococcus caprae*.



Figure 1. Clinical image of the mass in the right glute. Puncture fluid (1800 ml).



Figure 2. Anteroposterior radiographs of the right hip. Acetabular radiolucency is observed, which is indicative of backside wear.



Figure 3. CT scan of the right hip, coronal sections. Note the pedestal sign and backside wear in the inner third of the acetabular roof.

Table. Values of ions and acute phase reactants in blood.

	Result	Normal value
Ions		
Lead	4.30 µg/dl	<26 µg/dl
Cobalt	0.15 µg/dl	<0.05 µg/dl
Chrome	0.06 µg/dl	<0.05 µg/dl
Nickel	0.5 µg/dl	<1 <0.05 µg/dl
Acute phase reactants		
C-reactive protein	10.66 mg/l	0.5 mg/l
Erythrocyte sedimentation rate	53 mm/h	15 mm/h

Given the elevated values of cobalt, chromium, C-reactive protein, and erythrocyte sedimentation rate, as well as the images consistent with acetabular osteolysis and a gluteal tumor, a hip pseudotumor caused by the metal-on-metal bearings was suspected. After isolating the germ and knowing its sensitivity, a single-stage revision was performed.

Therapeutic plan

Tumor resection and acetabular revision were performed in the same procedure. The pseudotumor was identified using a Kocher-Langenbeck approach. With the help of a neurolocator, complete resection of the mass was achieved, avoiding damage to the sciatic nerve that was in close contact with the lesion (Figure 4).

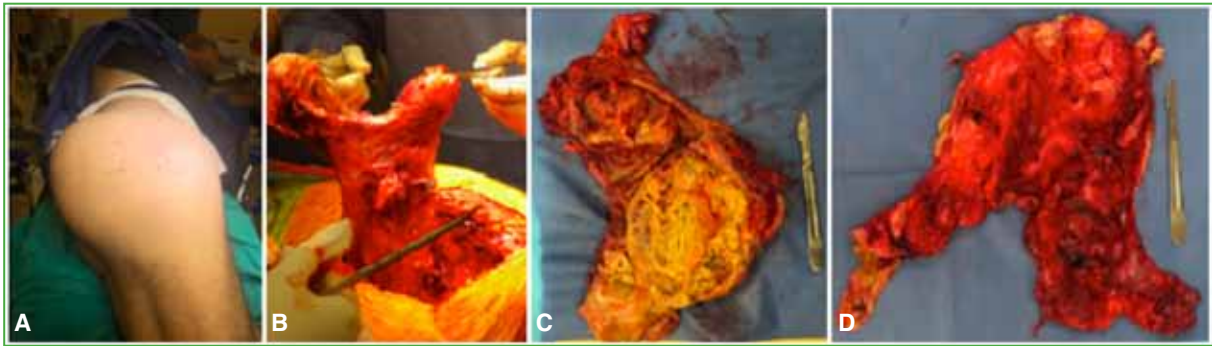


Figure 4. A. Position on the operating table. B. Intraoperative piece. C and D. Macroscopic image of the pseudotumor (with signs of metallosis).

The metal head and acetabular component Magnum M2a 38 (Biomet, Warsaw, Indiana, USA) were removed. The liner consisted of a metallic layer that covered the polyethylene on its articular face, which resulted in the metal-on-metal friction couple (Figure 5). The acetabular cup was retained, within which a universal cup liner with a 36+9 metal head was cemented, preserving the femoral stem (Figure 6).

The pathology report indicated: “fragments with fibrosis, fibrin deposits and chronic lymphocytic inflammatory infiltrate indicative of fibrinolysis/fibrosis/chronic inflammation” and the cultures (3 of 6) were positive for oxacillin-susceptible *S. caprae*. Oral antibiotic treatment with ciprofloxacin 500 mg and rifampicin 300 mg was administered every 12 hours for three months.

Six months after surgery, C-reactive protein, erythrocyte sedimentation rate, cobalt, and chromium values were normal. After two years, the patient suffered a hip dislocation after improper movement and underwent a closed reduction. After four years and five months, he has no symptoms or signs of hip or glute inflammation and could return to his normal activities (Figure 7).

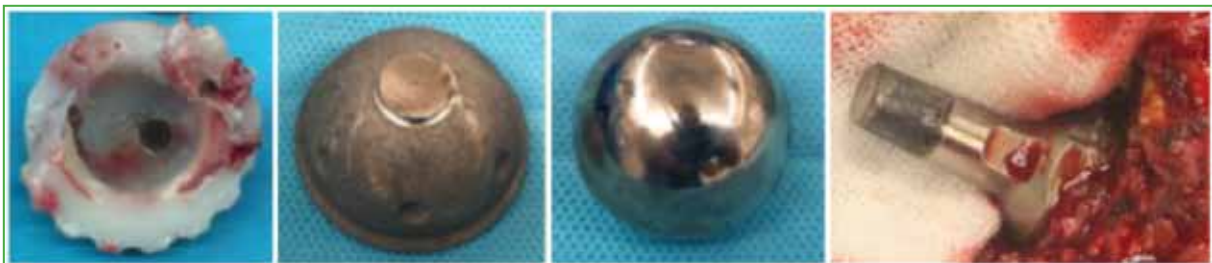


Figure 5. Worn components: liner, cup, metal head and cone.



Figure 6. Postoperative radiograph (AP view) of both hips.



Figure 7. AP radiograph of the right hip, 2 years after surgery.

DISCUSSION

The introduction of metal-on-metal bearings allowed for the elimination of polyethylene and, as a result, an increase in the size of the prosthesis head, which gives improved stability by expanding the range of motion.⁶ Several studies point to poor positioning of components and the use of a large femoral head as risk factors for the formation of pseudotumors.^{7,8} Other risk factors described include allergy to metal ions.⁹ The high rate of friction that occurs between the components generates the release of chromium, cobalt and nickel particles that can produce a local hypersensitivity reaction with the consequent formation of a pseudotumor.^{3,10} At a systemic level, complications have been described, such as hemoglobinopathies, hepatocellular and renal necrosis, asthma, cardiomyopathies, osteomalacia, vasculitis, maternal-fetal toxicity and DNA alterations related to carcinogenesis.⁹⁻¹¹

Although the prevalence of pseudotumors in THA with metal-on-metal bearings was believed to be relatively low,³ van Lingen et al. evaluated 94 patients with a minimum follow-up of 10 years and reported that the prevalence of pseudotumors in arthroplasties with metal-on-metal bearings was close to 41%.⁴ The five-year revision rate in patients with a pseudotumor is 6.2%, more than double than that of other friction couples.³ Many regulatory bodies, including the British Orthopedic Association, the Food and Drug Administration, and the Government of Canada,¹²⁻¹⁴ warned about the complications of THAs with metal-on-metal bearings and suggested monitoring patients with such implants¹⁵ whether or not they have symptoms.

Magnetic resonance imaging is an effective tool for diagnosing periarticular tumors, albeit the 'artifact' formed by the prosthesis can make vision difficult. Computed tomography and ultrasound are also extremely useful studies.¹⁶ Although some studies suggest mandatory monitoring of patients with THA with metal-on-metal bearings using ionograms,¹⁷ this idea is currently under discussion.⁴

Different treatment algorithms have been described for pseudotumors, including that of Lombardi et al.¹⁵ They recommend strict annual monitoring for asymptomatic patients with no or low levels of metals in their blood.^{3,15} In the case of symptomatic patients or those with a significant increase in blood ions (chromium or cobalt >7 µg/l), surgical treatment is recommended. It is important to note that approximately 50% of major complications have been reported in hip revisions for pseudotumors, a much higher rate than the 14% in revisions for other causes.¹⁸ Among the complications to be mentioned are those inherent to the surgical process that occur from addressing this type of intrusive mass, such as neurovascular damage. In our case, we used a neurolocator to identify the sciatic nerve and separate it from the pseudotumor in the resection of the tumor mass. We consider residual instability as a consequence of the weakening of the soft tissues, especially the abductor mechanism. In these cases, it would be advisable to consider the possibility of using cups with greater constriction to avoid this complication.

Although pseudotumors after THA have been widely described, reports of their association with periprosthetic infection are very rare, and no cases have been published in our country. In 2010, Watters et al.¹⁹ published the case of a 75-year-old patient with THA with metal-on-metal bearings performed two years earlier. The patient complained of pain and swelling in the leg opposite the hip replacement. On the studies, a pseudotumor mass that compressed the femoral vein was observed. Finally, the patient underwent hip revision surgery, the culture was positive for beta-hemolytic streptococcus, and he was administered intravenous antibiotics for six weeks. In 2013, Artiaco et al.²⁰ reported an atypical case of a patient with a pseudotumor infected by *Candida albicans*, who was treated with lavage and antifungals, with good outcomes.

Our patient had a large mass that caused a noticeable deformity in the right gluteus and paresthesia in the sciatic territory as the main symptom. Furthermore, the cobalt and chromium values in the blood were slightly increased, so we considered that the revision of the hip arthroplasty was a correct decision.

CONCLUSION

Pseudotumors are one of the possible long-term complications in THA with metal-on-metal bearings. Careful follow-up is required due to the serious consequences that could result from a late diagnosis. The possibility of concomitant periprosthetic infection should be considered, which could lead to an erroneous or incomplete diagnosis.

Conflict of interest: The authors declare no conflicts of interest.

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