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Case Report
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Use of Hip Resurfacing after Renal Transplantation: A Case Report

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Abstract

The prevalence of Cobalt-Chromium (Co-Cr) intoxication has increased in recent years due to the extensive use of metal hip implants. Here, we report the case of a 19-year-old woman who required kidney transplantation twice. She developed kidney failure on the graft kidney, most likely due to elevated blood levels of Co-Cr and local metal lose with pseudo tumor after resurfacing of the hips with Co-Cr alloy prosthesis. After revisions of joint replacements with ceramic-on-ceramic prostheses, blood levels of Co-Cr normalized and the local symptoms disappeared. Based on the observation of this patient, we recommend avoiding resurfacing in patients who have received organ transplants.

Keywords: Hip resurfacing; Metal ions level; Organ transplant

Introduction

Hip resurfacing involves implanting a large-diameter metal cup on the femoral head, articulated with an acetabular cup. This technique was reintroduced in the late 1990s, using the second-generation metal-to-metal prosthesis. It offered several advantages over conventional total hip prosthesis: preservation of femoral bone capital, maintenance of femoral biomechanics, reduced risk of dislocation, physiological proprioception, possible resumption of unrestricted sports activities, and easier surgical revision if required [1].

The popularity of hip resurfacing rose in the early 2000s such that hip resurfacing made up 35% of the total number of prosthetic procedures in 2009 in the United States. Unfortunately, hip resurfacing did not maintain these initial rates of popularity due to abnormally high rates of reoperation, which were 2 to 3 times higher than in other types of prostheses [2,3].

We report the case of a young female who presented an unusual complication related to hip resurfacing arthroplasty performed with metal-to-metal prosthesis.

Materials and Methods

A patient born in 1989, without any family history knew, developed end-stage renal disease with hemolytic uremic syndrome at 1 year of age, requiring immediate peritoneal dialysis followed by hemodialysis from 1998 onwards. In 1999, she received her first kidney transplant. Despite the usual treatment with immunosuppressive medications, an infection with Epstein–Barr virus resulted in rejection of the transplant. This viral infection combined with immunosuppressive treatment could be the cause of the subsequent development of a cerebral extra-nodal lymphoma, which was treated with chemotherapy. After the end of the cytostatic treatment, a second kidney transplant was performed in 2001, followed by the usual immunosuppressive therapy with cortisone.

In 2007, the patient complained of bilateral pain in her hips that was becoming increasingly disabling. Radiological examinations revealed bilateral necrosis of the femoral heads (Figure 1). Considering the age of the patient, stem cell therapy was attempted, unsuccessfully, most probably due to the ongoing immunosuppressive therapy.

After the failure of the stem cell therapy in January 2008 at the age of 19, hip resurfacing was performed: first on the right side, and 3 months later on the left side, using a metal-to-metal prosthesis with a head of 41 mm in diameter (Figure 2).

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Figure 1: Bilateral necrosis of the femoral heads. Lateral image (A) and AP (B) of the right hip. AP (C) and lateral (D) radiographs of the left hip. All images are characteristic of necrosis of the femoral head.

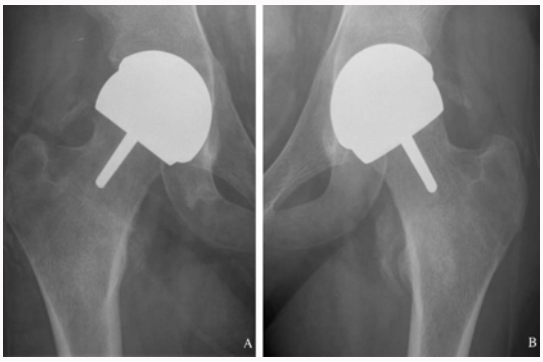

Figure 2: Immediate control of the resurfacings of the two hips with De Puy ASR™, Co-Cr alloy with a 41 mm friction torque in caliber.

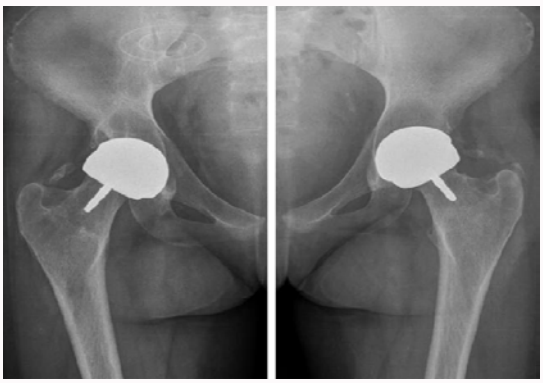

Figure 3: Two-year control of resurfacing. Radiography of the two hips revealed several lacunar lesions (osteolysis) in the right acetabulum, thinning both of the femoral neck and periprosthetic ossification.

The clinical examination conducted at the end of 2013 revealed a strongly painful limitation of hip movements bilaterally, especially during internal rotation. Radiography of both hips revealed several lacunar lesions (osteolysis) at the right acetabulum, thinning of both femoral necks, and periprosthetic ossifications. The examination raised the possibility of pseudo tumor formation in both hips (but more so on the left side), that may be in concordance with metal lose-related periprosthetic granulomas causing loosening (Figure 3).

Figure 4: Periprosthetic fracture on unsealed prosthesis of the right hip after a banal trauma.

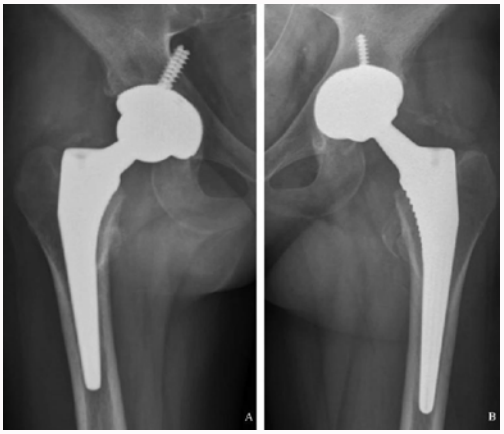

Figure 5: Immediate control of THA of both hips with un cemented stems (Avenir, Zimmer, Belgium) with ceramic heads 32 mm in diameter.

In January 2014, common trauma caused periprosthetic fracture of the right femoral neck (Figure 4) requiring immediate surgical revision. During the surgical revision, we found a very thick and blackened joint capsule. The articular cavity was filled with dark gray granulomatous tissue. This hypertrophic tissue was present not only around the neck of the femur and the acetabulum but also below the cup, destroying in this way the upper and posterior edge of the acetabulum. An un-cemented cup with a ceramic coating, fixed by two screws, was put in place. Osteolytic acetabular lacunae were filled with fractured bone grafts (freeze-dried bone) from the bone bank. The femoral part was taken up by a non-cemented stem (Avenir, Zimmer, Belgium) with a ceramic head 32 mm in diameter (Figure 5).

Due to the severe metallosis detected during the revision, a blood test for chromium and cobalt metal ions was performed. The chromium blood level was 49.93 μg/L – 25 times higher than the normal maximum value. For cobalt blood level, the measured value was 7.68 μg/L – 17 times higher than the normal maximum blood level (for the method used, the normal level of chromium is 0.12-2.1 μg/L; and for cobalt, 0.0-0.45 μg/L).

Based on the patient's history and elevated blood chromium and cobalt levels, the patient received a revision of her total left hip replacement three months after revision of her total hip arthroplasty

Figure 6: Tissues collected during the first revision with massive macroscopic metallosis.

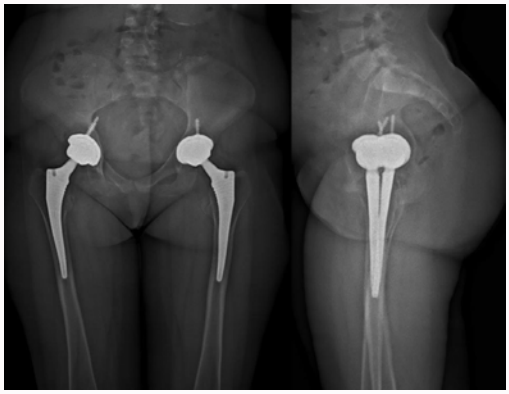

Figure 7: Last PTH check with EOS.

(Figure 6). Three months after the second revision, chromium, and cobalt levels had already significantly decreased (chromium: 20.8 µg/L; cobalt: 1.59 µg/L). Since 2015, the blood level of heavy metals has remained normal (chromium: below 2 µg/L; cobalt: below 0.45 µg/L).

Currently, the patient is well, with complete hip movement on both sides. She walks without a limp and without pain. The last EOS examination (Figure 7) showed perfect equality of both lower limbs without evidence of prosthesis loosening. In 2015, the patient had a third kidney transplant that works very well now, as shown by the last renal assessment of April 2018 (urea: 34 mg/mL; creatinine: 0.79 mg/mL; GFR: 110 mL/min/L; 73 m^2).

Results and Discussion

Despite the initial enthusiasm surrounding hip resurfacing, this treatment has decreased in popularity because of the significant need for reoperations encountered already in the short term follow-up [4]. General severe complications have also contributed to their decreased use [5,6]. Failures have been attributed to the massive release of metal particles [7], which can cause periarticular local reactions and systemic reactions [8]. At the local level, these reactions can include the development of periarticular solid masses qualified as pseudo-tumors, which can be present in 35% to 61% of cases [9,10]. These pseudo-tumors are frequently associated with pain and can be accompanied by periarticular osteolysis, requiring surgical revision [11].

In the case presented, behind the bilateral pain and hip fracture, the presence of a pseudo-tumor caused by metallosis was demonstrated. Whether primary indication of resurfacing is a viable treatment, approach remains undecided because, in cases of necrosis of the femoral head, the femoral component can be unstable [12]. A more severe matter is that of systemic complications resulting from the increased blood Co-Cr ions [13]. Co-Cr ions can induce activation of monocytes, macrophages and the secretion of pro-inflammatory cytokines. It can also induce two types of hypersensitivity reactions: immediate reaction (Type I, anaphylactic) and delayed type reaction (Type IV) [14]. The latter reaction plays an important role in the rejection of transplanted organs. However, there is no direct evidence that Co-Cr-induced immunological reactions play a determining role in the renal failure of a transplanted kidney. On the other hand, it is clear that elevated Co-Cr levels play an essential role in the development of severe apathy and the constant feeling of fatigue [15], which we observed in the patient presented.

Furthermore, our patient's rapid improvement after resurfacing revisions serves as indirect evidence for the negative role Co-Cr ions in local and systemic reactions.

Conclusion

Based on this case, we believe that metal-to-metal prostheses should be avoided in patients who have had organ transplants.

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