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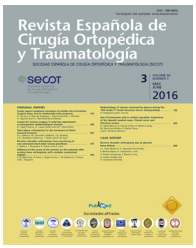

CASE REPORT

Cobalt toxicity after revision total hip replacement due to fracture of a ceramic head☆

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KEYWORDS
Ceramic;
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Abstract Symptomatic cobalt toxicity from a failed total hip replacement is a rare, but devastating complication. Potential clinical findings include cardiomyopathy, hypothyroidism, skin rash, visual and hearing impairment, polycythaemia, weakness, fatigue, cognitive impairment, and neuropathy. The case is presented of a 74 year-old man in whom, after a ceramic–ceramic replacement and two episodes of prosthetic dislocation, it was decided to replace it with a polyethylene–metal total hip arthroplasty (THA). At 6 months after the revision he developed symptoms of cobalt toxicity, confirmed by analytical determination (serum cobalt level = 651.2 μg/L). After removal of the prosthesis, the levels of chromium and cobalt in blood and urine returned to normal, with the patient currently being asymptomatic. It is recommended to use a new ceramic on ceramic bearing at revision, in order to minimise the risk of wear-related cobalt toxicity following breakage of ceramic components.

PALABRAS CLAVE
Cerámica;
Intoxicación con cobalto;
Prótesis de cadera;
Reemplazo de cadera;
Fractura de cerámica

Toxicidad por cobalto después de la revisión a una artroplastia total de cadera posterior a fractura de cabeza cerámica

Resumen La intoxicación por cobalto después de la revisión de una artroplastia total de cadera es poco común, pero una complicación potencialmente devastadora. Los síntomas incluyen: cardiomiopatía, hipotiroidismo, erupciones en la piel, alteraciones visuales, cambios en la audición, policitemia, debilidad, fatiga, deterioro cognitivo y neuropatía. Presentamos el caso de un varón de 74 años que tras recambio a par cerámica-cerámica y dos episodios de luxación

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protésica se decidió nuevo recambio a par polietileno-metal. A los 6 meses de la reintervención comenzó con clínica de intoxicación por cobalto, confirmada mediante determinación analítica, presentando niveles pico de cobalto en suero de 651,2 μg/l. Tras retirada protésica y reimplante, se normalizaron los niveles de cromo y cobalto en sangre y orina, encontrándose el paciente actualmente asintomático. Recomendamos el uso de pares cerámica-cerámica en las cirugías de revisión de cadera tras rotura de componentes cerámicos para reducir al mínimo el riesgo de toxicidad por cobalto.

Introduction

Ceramic-on-ceramic bearings used in total hip replacement were first developed in the seventies in the hope that ceramic's low incidence of wear would reduce the rates of revision surgery.[1,2] Unfortunately, ceramic components can fracture due to their fragility and low elasticity coefficient.[3] Failure of the ceramic femoral head component is most common after a traumatic event, whereas acetabular inserts commonly fail where there is no history of trauma.[4]

Recent manufacturer's data (CeramTec GmbH, Plochingen, Germany) show a significant reduction in the rate of fractures of fourth generation Biolox Delta ceramic heads (0.002%) compared to third generation ceramic heads (0.021%).[5] The fracture rates of third and fourth generation ceramic liners have remained relatively constant at 0.032% and 0.028%, respectively.[5] When revision component options are discussed after a catastrophic failure, patients are often reluctant to accept another ceramic device for fear of a further fracture of the component. This is one reason, amongst others, that polyethylene metal is often chosen in conjunction with synovectomy to mitigate the amount of residual ceramic particles and thus avoid increased rates of wear. However, it has been demonstrated that reliably removing all ceramic debris without extensive anterior dissection and subsequent synovectomy is extremely difficult.[6] These residual particles incorporated in polyethylene rapidly increase the rates of wear on the prosthetic head and expose the patient to the toxic effects of heavy metals.

We present the case of a 74-year-old man presenting symptoms of cobalt toxicity after change of a total hip replacement prosthesis with a fractured ceramic-on-ceramic bearing to a polyethylene-metal total hip arthroplasty. At the time of the initial revision surgery it was found that the ceramic head was fractured and the acetabular lining was intact. Our aim is to show the patient's clinical progress, determine the clinical features of cobalt toxicity, discuss the radiological and intraoperative findings, and finally to review the recommendations for the management and prevention of this complication.

Clinical case

A 74-year-old man with a history of type 2 diabetes, physically active, who had undergone a total hip arthroplasty with a ceramic-on-ceramic bearing in 2004: Duofit cup (SAMO, Bologna, Italy), Bioceramic head (SAMO, Bologna, Italy), F2L stem (Lima-Lto, Udine, Italy). He had resumed his usual daily activities, when in 2010 during a game of racquetball he felt a crack and was taken to the emergency department. X-ray showed prosthetic luxation with fracture of ceramic head. The patient was operated and the Biolox-forte (Lima-Lto, Udine, Italy) ceramic head was changed. It was decided not to remove the remaining prosthetic components that were well implanted. Ten days after the operation the patient suffered another episode of luxation after getting up from his sofa at home. He was admitted to the emergency department and the prosthesis was reduced under sedation. A CAT scan was performed which showed the correct alignment of the prosthetic components, and the patient was discharged from hospital with anti-luxation control measures. One month after the reduction he suffered a further episode of prosthetic luxation, and was admitted for revision surgery: removal of cup, a new Delta TT titanium cup (Lima-Lto, Udine, Italy) was impacted and a polyethylene anti-luxation insert was placed, Delta Cup-UHMWPE X (Lima-Lto, Udine, Italy). The surgeon decided not to change the stem which was stable, and to achieve better stability of the prosthesis decided to place an extra long metal CRCrMo head (Lima-Lto, Udine, Italy). After appropriate radiographic control, the patient was discharged and given an outpatient appointment for follow-up.

At 12 months after the operation the patient reported increasingly constant and debilitating pain. He also presented asthenia, general malaise with weight loss of 10 kg, sallow complexion, choluria, urticaria, neuropathic pain (meralgia paresthetica), hypothyroidism that had started a month previously, and hearing loss.

The analytic study showed CRP: 20.7, neutrophilia (76.5%) with no leukocytosis and eosinophilia (12.3%).

Plain X-ray revealed peri-articular calcifications and reduced radiographic density which was interpreted as the presence of liquid content in the joint. CAT scan revealed heterotopic calcifications in an intra- and extra-capsular location with involvement of all the periprosthetic muscle groups and no signs of loosening (Fig. 1).

Hard metal disease was suspected clinically, tests were requested to determine blood and urine chromium and cobalt levels, revealing a urinary chromium level of 119 μg/l (normal up to 25 μg/l), a serum chromium level of 55.7 μg/l (normal up to 15 μg/l), a serum cobalt level of 651.2 μg/l