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ORIGINAL ARTICLE

Long-term follow-up of tantalum monoblock acetabular component☆

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KEYWORDS
Total hip replacement;
Cementless implant;
Tantalum;
Osseointegration

Abstract
Objective: To evaluate the clinical and radiological results of a tantalum acetabular monoblock with a mean follow-up of 12 years.
Material and method: A prospective follow-up was performed on 23 hip replacements in 23 patients. The most frequent diagnosis was primary coxarthrosis (9 cases) and avascular necrosis (7 cases). The clinical results were assessed using the Merle D'Aubigne-Postel scale. The orientation of the components, the integration of the acetabula, and the presence of post-operative hiatus, or the appearance of radiolucent lines were evaluated. The polyethylene wear was measured using the Kim method.
Results: The mean follow-up of the series was 12 years. All the implants were osseointegrated at the end of follow-up. The mean values of, pain, ability in walking, and mobility on the Merle D'Aubigne-Postel scale were 5.4, 5.2 and 4.4, respectively, at the end of follow-up. A post-operative hiatus had not been filled in one acetabulum, and 4 implants had non-progressive radiolucent lines in the area of the DeLee zone 1.
Conclusions: Tantalum acetabular monoblocks have an excellent survival with follow-ups longer than ten years in primary hip surgery.

PALABRAS CLAVE
Prótesis total de cadera;
Prótesis no cementada;
Tantalio;
Osteointegración

Componente acetabular monobloque de tantalio. Seguimiento a largo plazo

Resumen
Objetivo: Valorar los resultados clínicos y radiológicos de un cotilo monobloque de tantalio con un seguimiento medio de 12 años.
Material y método: Se siguieron prospectivamente 23 prótesis de cadera en 23 pacientes. Los diagnósticos más frecuentes fueron coxartrosis primaria (9 casos) y necrosis avascular (7 casos). Los resultados clínicos fueron valorados con la escala de Merle D'Aubigne-Postel. Se midieron la orientación de los componentes, la integración de los cotilos y la presencia de hiatos post-operatorios o aparición de líneas radiolúcidas. El desgaste del polietileno fue medido con el método de Kim.

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Resultados: El seguimiento medio de la serie fue de 12 años. Todos los implantes se encontraban osteointegrados al final del seguimiento. Los valores medios de dolor, capacidad de deambulación y movilidad en la escala de Merle D'Aubigne-Postel fueron 5,4, 5,2 y 4,4 respectivamente al final del seguimiento. En un cotilo un hiato postoperatorio no se había rellenado y 4 implantes tenían líneas radiolúcidas no progresivas en la parte de la zona 1 de DeLee.
Conclusiones: Los cotilos monobloque de tantalio presentan una excelente supervivencia con seguimientos superiores a diez años en cirugía primaria de cadera.

Introduction

At present, cementless fixation of the acetabular component is the most widespread in primary arthroplasty of the hip. The survival of these implants depends on a series of factors, including the material, design, manufacturing process and method of sterilization, the osteoinductive and osteoconductive properties of the implant, and on the stability of the initial fixation of the acetabular cup.[1–4] Good primary stability will foster osseointegration of the acetabular cup.[5]

New materials and designs have been developed in an attempt to improve implant survival. In 1997, tantalum began to be used in primary hip surgery. This material has certain characteristics that make it very attractive for the development of implants for orthopaedic surgery. It has a high friction coefficient with bone, which offers an outstanding primary fixation. Second, it is a material with close to 80% porosity and a pore size of 550 μm, which favours osseointegration.[6–9] Third, its 3 GPa modulus of elasticity is similar to that of subchondral bone (2 GPa), which, in addition to facilitating the growth of bone on the implant, also makes the distribution of loads more physiological, thereby decreasing bone resorption.[8–10]

Monoblock components are associated with a lower rate of wear between the polyethylene and the implant. The wear particles do not have access to the fundus of the implant since there are no holes for the insertion of screws. Because it does not require a system of fixation for the insert, the acetabular component can be thinner, making it possible to implant thicker polyethylenes.[10–12] The hypothesis of this paper is to determine whether the greater integration capacity of tantalum would improve the survival rate of these uncemented acetabular cups.

Material and method

Between March 1998 and March 1999, one of the authors (EGG) implanted 23 Hedrocel monoblock acetabular components (Implex Corp., Allendale, NJ) in our centre as part of a prospective study. The cup used was an elliptical tantalum acetabular cup with an equatorial diameter 2 mm greater than the polar diameter. The conventional polyethylene insert was compression moulded on the tantalum cup, penetrating to a depth of between 1 and 2 mm, leaving 2–3 mm of tantalum for the osseointegration of the implant.[13] The acetabular cups had been sterilized in nitrogen with 30 kGy of cobalt gamma radiation (Table 1).

The series included 23 patients (10 males and 13 females): 12 left hips and 11 right hips. The mean age at the time of surgery was 63 years (range: 50–70 years) for men and 57 (range: 31–80) for women. Four patients were under the age of 40; 19 were between 50 and 70 years of age, and 4 patients were over the age of 70. The diagnoses included 9 primary arthrosis, 7 avascular necrosis, 2 pseudoarthrosis following subcapital fractures synthesized with cannulated screws, 1 post-traumatic arthrosis, 1 ankylosing spondylitis, and 1 hip dysplasia.

All the surgical interventions were performed with the patients lying on their side using a direct lateral approach (after Hardinge)[14]. The acetabulum was prepared with ball reamers. The component implanted was 1 mm larger than the last reamer in 6 cases and 2 mm larger in 2 cases. In the remaining 15 cases, the reamer and the implant were the same size, since the latter had a peripheral diameter that was oversized. This design did not allow for supplementary fixation with screws, as it was a monoblock implant. In 8 cases, milled autograft (taken from the last reamings) was added in the bottom of the acetabular cup.

On the femoral side, the decision as to the choice of implant depended on the patient's age, the femoral bone stock, and on the morphology of the proximal femur. In 17 cases, an uncemented Meridian stem (Howmedica, Rutherford, NJ, USA) was used. In the remaining 6 cases a cemented, Charnley Elite stem (Depuy, Warsaw, IN, USA) was used. In all cases, a 28-mm chromium–cobalt head was implanted.

All the patients received prophylactic intravenous antibiotic treatment, consisting of 1 g of cephazolin every 8 hours for 48 hours and anti-thrombotic prophylaxis with 40 mg of subcutaneous enoxaparin daily for 4 weeks. Drains were removed after 48 hours. Rehabilitation of walking was started at 48 hours using two canes and partial loading. Full loading was begun at six weeks.

All patients were prospectively assessed with postoperative clinical–radiological evaluations performed at 3, 6, and 12 months and then yearly after that. The clinical evaluation included the assessment of pain, function, and degree of joint mobility as per the Merle D'Aubigné-Postel rating scale that varies from 1 (continuous, disabling pain in any position, patients cannot walk and total mobility is less than 30°) up to 6 (patients are pain-free, walk normally, and their degree of joint mobility is greater than 211°). Degrees 5 and 6 are considered to be a good clinical outcome and degrees 4 and less are considered to represent a poor outcome.[15]