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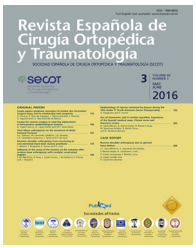

ORIGINAL ARTICLE

The impact of subsidence on straight and curved modular cementless revision stems in hip revision surgery☆

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KEYWORDS
Straight modular stems;
Curved modular stems;
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Abstract Subsidence is one of the potential complications in femoral stem revision total hip arthroplasty surgery, and can affect stability and osseointegration.

A retrospective study was conducted on the outcomes at one year and 5 years (specifically subsidence and clinical relevance) of 40 consecutive femoral total hip arthroplasty revisions, comparing two modular cementless revision stems, straight vs. curved, with 20 patients in each group. No mechanical failure was observed, and there was an improvement in functional outcomes. Mean radiological subsidence was 9.9 ± 4.9 mm (straight = 10.75 mm vs. curved = 9.03 mm), with no statistically significant difference between groups ($p = 0.076$). Fourteen patients (35%) had ≥10 mm of subsidence, up to a maximum of 22 mm.

The subsidence found in this study is similar to published series, with no short-term clinical manifestations, or an increased number of complications or stem loosening in either the straight or curved group. No differences in subsidence were observed at one year and 5 years after surgery between the 2 types of stems.

PALABRAS CLAVE
Vástagos rectos modulares;
Vástagos curvos modulares;

Impacto del hundimiento en vástagos de revisión rectos y curvos modulares en cirugía de revisión de cadera

Resumen El hundimiento protésico es una de las potenciales complicaciones de los vástagos femorales de anclaje diafisario no cementado en las cirugías de revisión protésica, lo cual puede afectar a la estabilidad y a la osteointegración del componente.

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Hundimiento protésico

En este estudio retrospectivo evaluamos los resultados al año y a los 5 años (especialmente el hundimiento y la relevancia clínica) de 40 revisiones de vástago femoral consecutivas, comparando 2 vástagos de revisión modulares no cementados rectos vs. curvos, con 20 pacientes en cada grupo. No se observó ningún fracaso mecánico y se obtuvo una mejoría en cuanto a resultados funcionales en la totalidad de los casos. El hundimiento radiológico medio fue de $9{,}9 \pm 4{,}9$ mm ($p = 0{,}076$); 14 pacientes (35%) tuvieron $\geq$10 mm de hundimiento, con un máximo de 22 mm en un caso.

Nuestros resultados son similares a las series publicadas en la literatura, sin manifestaciones clínicas a corto-medio plazo ni incremento del número de complicaciones o aflojamiento del vástago en ninguno de los 2 grupos. No se observaron diferencias en cuanto al hundimiento protésico al año y a los 5 años posteriores a la cirugía entre los 2 tipos de vástagos.

Introduction

In recent years, a growing number of patients require the implantation of a total hip prosthesis (THP) as a result of the excellent clinical results obtained with implants of this type. In consequence, due to the limited life of these prostheses, prosthetic revision surgery is growing and will continue to grow in orthopaedic surgery departments.[1] The procedure is extremely complex because of peri-prosthetic bone loss and it may pose a major challenge for an orthopaedic surgeon, who must be aware of the different surgical techniques and the design of the new stems.[2]

The primary bone defect will determine the surgical technique: with or without cement, the use of a graft or otherwise, or the prosthetic system to be used to fix the femoral stem. We can find various models of prostheses available on the market for THP revision surgery and none of them is clearly superior to the others. Nonetheless, cementless models seem to adapt better to femoral revision surgery due to the lower degree of interdigitation of cement inside the femoral channel, which is increased in size as a result of prosthetic loosening and osteoporosis, with 79% of cement strength loss compared to primary arthroplasties.[3,4] More specifically, in 1987, Wagner introduced a new cementless technique using long conical stems with diaphyseal anchorage and obtaining excellent results.[5]

Initially, all stems were straight; however, the emergence of fractures and perforations of the anterior femoral cortex in patients with a narrow isthmus, and especially in endofemoral approaches, led to the development of curved modular stems that attempted to reproduce the anterior femoral curvature. These stems also provided greater rotational stability due to the longitudinal slots in the octagonal cross-section of the implant. Many studies have now confirmed the good outcomes obtained with this type of stem,[6–9] suggesting less subsidence with curved stems,[6] but no study to date has compared curved and straight stems.

We designed this study at our centre to evaluate the radiological outcomes of the subsidence of cementless striated conical modular stems, comparing straight and curved models. Secondary goals included the analysis of the functional outcomes, the complications and the impact of the surgical approach used.

Material and methods

A retrospective review was performed on 40 patients operated on for THP revision surgery using Revitan® modular stems with diaphyseal fixation (Zimmer GmbH, Winterthur, Switzerland). All the procedures were performed by 3 senior surgeons from the hip unit at out centre (M.C., M.F., L.A.) during the period between December 2008, and December, 2010. The follow-up has continued for up to 5 years.

Two different types of stems were used: Revitan® straight modular stems and Revitan® curved modular stems without lock. The Revitan® system is a cementless modular revision implant made of a titanium alloy; it comprises both a proximal and a distal component. There are 2 types of proximal component: augmented or cylindrical; and 6 lengths available (from 55 to 105 mm in 10 mm increments), a 135° cervical-diaphyseal angle and an offset of 44 mm. The distal component can be straight or curved. The straight stems are conical, with longitudinal ribbing that provides rotational stability; available in 3 lengths (140, 200 and 260 mm) and the diameter increases from 14 to 24 mm in 2 mm increments. Curved stems have an octagonal cross-section giving them rotational stability and they present a sagittal curvature along their longitudinal axis, making the morphology more anatomical, in line with the femoral antecurvature. We have curved stems available with the same lengths and diameters as the straight stems, with the advantage that the 200 and 260 mm lengths can be locked distally with blocking screws in calibres starting from 18 mm.

For this study, the first 20 cases receiving a straight stem and the first 20 cases receiving a curved stem were selected (the curved stem was launched onto the market a year later and these were the first ones implanted at the department), and a comparative study was conducted *a posteriori* between the two groups. The type of prosthesis was chosen by the surgeon during the pre-operative planning, bearing in mind: the length of the osteotomy, the distance from the cement and plug, endofemoral fixation and type of defect.

A comparative study was carried out between the two groups of patients depending on the type of stem implanted, giving 2 groups of 20 patients. In addition, a comparative statistical study was performed on the different variables in both groups.