

REVIEW ARTICLE

## Hip prostheses in young adults. Surface prostheses and short-stem prostheses<sup>☆</sup>



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Received 12 April 2017; accepted 28 October 2017

### KEYWORDS

Total hip arthroplasty;  
Short stem;  
Hip resurfacing;  
Young patient

**Abstract** The poor results obtained in young patients when using a conventional prosthesis led to the resurgence of hip resurfacing to find less invasive implants for the bone. Young patients present a demand for additional activity, which makes them a serious challenge for the survival of implants. In addition, new information technologies contribute decisively to the preference for non-cemented prostheses. Maintaining quality of life, preserving the bone and soft tissues, as well as achieving a very stable implant, are the goals of every hip orthopaedic surgeon for these patients. The results in research point to the use of smaller prostheses, which use the metaphyseal zone more and less the diaphyseal zone, and hence the large number of the abovementioned short stem prostheses. Both models are principally indicated in the young adult. Their revision should be a more simple operation, but this is only true for hip resurfacing, not for short stems.

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### PALABRAS CLAVE

Prótesis total de cadera;  
Vástago corto;  
Prótesis de superficie;  
Paciente joven

**Las prótesis de cadera en el adulto joven. Prótesis de superficie y prótesis de vástago corto**

**Resumen** Los malos resultados obtenidos en pacientes jóvenes cuando se utiliza una prótesis convencional fueron la causa que motivó el resurgir de las prótesis de superficie, en un intento de buscar implantes menos invasivos para el hueso. Los pacientes jóvenes presentan una demanda de actividad adicional, lo cual los convierte en un serio reto para la supervivencia de los implantes. Además, las nuevas tecnologías de la información contribuyen de forma determinante a la preferencia de prótesis no cementadas. Mantener la calidad de vida, preservar el hueso y las partes blandas, así como conseguir un implante muy estable, son los objetivos que todo cirujano ortopédico de cadera persigue para este tipo de pacientes. Los resultados en investigación apuntan hacia el uso de prótesis de menor tamaño, que utilicen más la zona metafisaria

<sup>☆</sup> Please cite this article as: Gallart X, Riba J, Fernández-Valencia JA, Bori G, Muñoz-Mahamud E, Combalia A. Las prótesis de cadera en el adulto joven. Prótesis de superficie y prótesis de vástago corto. Rev Esp Cir Ortop Traumatol. 2018;62:142–152.

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y menos la diafisaria, dando lugar al extenso capítulo de las mencionadas prótesis de vástago corto. Ambos modelos tienen su principal indicación en el adulto joven. Su revisión debería ser una cirugía más sencilla pero este hecho solo se cumple para las prótesis de superficie, no así para los vástagos cortos.

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## Introduction

It may seem appropriate to talk about surface prostheses (SP) and short-stem prostheses (SSP) together, given that they share their main indication, which is use in young adults with good quality bone. However, the truth is that after this shared history they have clearly parted company, and while the use of SP or resurfacing prostheses seems to be in irreversible decline,<sup>1</sup> SSP are only now coming into widespread use.<sup>2</sup>

Young people are increasingly becoming candidates for total hip arthroplasty (THA) to the detriment of femoral osteotomies. Because of their long postoperative recovery times the latter are not always free of morbidity, and they have been giving way to implants which have a far faster and safer recovery period.

THA is one of the most successful procedures in orthopaedic surgery. Together with the excellent results of traditional cemented prostheses, many publications praise the good long-term qualities of uncemented ones.<sup>3</sup> Cement is a vulnerable interface in situations of intense activity and it degrades over time, even though it has been proven to give good results over the very long term. Given the bonanza of figures from national arthroplasty records about cemented prostheses, the fact that their manufacturers display less interest in research and development in connection with them is striking. The explanation for this may be purely commercial. Uncemented connections are more biological and direct, and they renew cyclically. From a technical point of view they seem to be less demanding, and they are therefore preferred by surgeons.<sup>4</sup>

In comparison with older patients, younger ones are more active in work as well as during leisure, and this is a serious challenge for implant survival. Moreover, the new information technologies have contributed decisively to this preference for uncemented prostheses. It has been calculated that a young, healthy and active patient may move their hips through approximately 5 million cycles per year. All orthopaedic surgeons have the objectives of maintaining a good quality of life, preserving the bone and soft tissue and also creating a very stable implant in patients of this type. Once again, national arthroplasty records show that implants in young adults last for far less time than they do in older individuals.<sup>5</sup>

Implant design, as well as their shape, length, materials and associated surgical technique all play important roles in the success of THA. Nowadays fixing implants has ceased to be the centre of attention, and modern friction

joints generate far less relevant amounts of particles due to wear than they used to.<sup>6</sup> Nevertheless, some questions remain to be resolved. Preservation of the bone has to be achieved at two levels: less bone should be removed during surgery, although the transmission of the load to the femur has to be optimised. Some publications have already warned of the severe loss of bone that occurs with certain stem designs over the very long term.<sup>7</sup> All implants that are in contact with the cortical diaphysary bone and which integrate in the metaphysary part will bring about an anomalous load transfer that over the long-term will cause a loss of bone capital due to stress protection short circuiting ('stress-shielding'). All implants that exclusively anchor in the diaphysary bone may be associated with thigh pain over the short term and loss of proximal bone over the long term. Additionally, as Amstutz and le Duff<sup>8</sup> state, extracting the implant if this becomes necessary causes major problems. Due to these and several other reasons, research (which is often industry funded) indicates that smaller prostheses should be used that make more use of the metaphysary zone and less use of the diaphysary zone. This has given rise to the long chapter about the said SSP, which follows the one on SP or resurfacings.

## Surface or resurfacing prostheses

### Justification of their design

Metal-metal joints were widely used in the 1980s. The well-known Metasul (Sulzer AG<sup>®</sup>, Winterthur, Switzerland) with 28 mm heads made of forged metal gave no problems with the liberation of metallic ions. Metallic friction with 28 mm heads has not been shown to have any carcinogenic, teratogenic or renal effects. The problems emerged later with SP made of cast metal that was softer and rougher. Once design errors too are taken into account, this explains the higher rate of failures in large diameter metal-metal joints.<sup>9</sup>

The poor results obtained in young patients when a conventional THA is used were the reason why interest resurged in SP, in an attempt to find implants that are less invasive of the bone. Their indication depends on patient age, bone quality, disease and joint deformity. The revision rate for implants of this type is not inconsiderable. Nevertheless, on condition that patients are selected correctly, their working and results seem to be guaranteed. But this was not always the case, and their use is now always controversial.<sup>10</sup> Due to this we believe that this type of implant should be covered by a separate chapter from the corresponding to SSP.

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