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EDITORIAL

Total Hip Arthroplasty, state of the art for the 21st century

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The main surgical procedure in orthopaedics at the turn of two centuries is without any doubt total hip arthroplasty. For this reason, the Editorial Board has asked us to moderate this special issue, now an annual feature in our Journal.

After several trials during the first half of the 20th century, the first joint replacements in clinical practice were femoral head prostheses, including the one developed by Jean and Robert Judet in 1948 in France.

In total hip arthroplasty, a major advance was made in 1962 by Sir John Charnley in the United Kingdom who introduced metal-on-plastic bearings including the low friction torque arthroplasty (LFA) combining a 22.2-mm head and a full polyethylene socket, both components being fixed to bone by methacrylate cement. The major advantage of LFA was the hard on soft friction couple, which is highly resistant to wear and breakage.

Indeed, despite wear, a number of the all-polyethylene sockets after more than 20 years in vivo still provide a satisfactory clinical outcome, sometimes with no radiographic osteolysis. The usual wear rate of LFA using original, high density polyethylene sterilised with ethylene oxide was 0.1 mm/year, but the wear rate became greater when ethylene oxide was replaced by gamma irradiation in oxygen. The current standard using conventional polyethylene sterilised in an inert atmosphere has returned the wear rate to 0.1 mm/year.

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Impingement is a common phenomenon associated with total hip replacement. In the case of a hard-on-soft friction couple, as in Charnley-type LFA, this phenomenon has no catastrophic consequences in contrast to hard-on-hard bearings (metal and ceramic), causing chipping for ceramic-on-ceramic or metal ions release and metallosis for metal-on-metal.

Several papers have reported satisfactory outcomes for Charnley-type total hip arthroplasty. The Mayo clinic series published in 2002 [1] reported a survival rate free of revision for aseptic loosening at 25 years of 86.5% (68.7% in patients less than 40 years of age and 100% for patients older than 80 years). Wroblewski et al. [24] demonstrated a survival of 72.5% and 53.7% for the femoral and acetabular components, respectively, at 38-year follow-up using loosening as the endpoint. The results from Cochin Hospital (Paris, France) in patients less than 50 years old [8] indicated a survival of 96% at ten years and 89.5% at 20 years. The latest paper, published by Callaghan et al. on a series of patients operated by CR Jonhston in Iowa City [3], reported a survival of 78%±8% at 35 years.

The goal of this special issue which includes 20 papers was to update the current state of the art in THA.

THA is a widely performed procedure in the vast majority of countries. It could be stated that Charnley-type THA is the gold standard in view of the long-term results [17]. Collection and appreciation of the long-term results can be difficult [2], although registers are commonly used [10].

Patient information and education cannot be ignored and has become part of function improvement. Surgical approaches have been reduced to be less invasive [14] in order to allow more rapid recovery; however, these should not be performed to the detriment of the mechanical reconstruction of the joint nor to the safety of the procedure [20]. Navigation has yet to demonstrate its superiority but remains an interesting biomechanical way of researching joint stability and implant positioning. Cementless fixation has made tremendous progress with the introduction of bioactive surfaces such as hydroxyapatite, and for some designs it has become equivalent to cemented fixation at 20-year follow-up [22]. From the 1980s, alternate surface bearings have been introduced to limit the effect of wear, including metal-on-metal [21] and ceramic-on-ceramic [6, 9]. Promising mid- to long-term results are now available, especially for ceramic-on-ceramic first implanted by the French surgeon P. Boutin 40 years ago. Wear that was the main limitation of polyethylene might have been overcome with the introduction of highly cross-linked and melted material including the addition of vitamin E [15]. After poor initial results some decades ago, resurfacing arthroplasty has been re-introduced and can be considered in some indications instead of conventional THA [4, 12].

However, despite all this progress, complications still occur after this procedure, nevertheless results are usually very good. Complications include infections, with an incidence of 1% [19], but which continue to be difficult to treat; and dislocation, which can be avoided with proper implant positioning, large diameter femoral heads, and dual mobility sockets [23]. Periprosthetic osteolysis related to cellular reactions to wear debris currently represents the weak link of very long-term implant survival, but a biological solution might be available in the future [11]. These complications may require revision surgery that should be addressed with a global strategy that aims at partial or total component revision [16], and the placement of cemented [7] or cementless [13] implants, often accompanied by the necessity to restore bone stock [5, 18].

In spite of highly satisfactory functional outcomes, some problems associated with THA remain in relation to joint mechanics, the integration of the prosthesis in the body system, and complications related to patients' morbidity (deformations, obesity, neurological pathology, etc.). These could not all be addressed in this special issue. We hope that this update will help readers to have a deeper understanding of this complex subject of worldwide interest to patients and surgeons, and provide some solutions to the remaining complications.

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