On the longevity of cemented hip prostheses and the influence on implant design

Mette Ørskov Sjøland, MD

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Official opponents: Ole Simonsen, Bjarne Lund, and Uldis Kesteris, Sweden.

Tutors: Kjeld Søballe and Per Riegels-Nielsen.

Correspondence: Mette Ørskov Sjøland, Taubersvej 13, 6000 Kolding. Denmark.

E-mail: orskov@dadlnet.dk

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ABSTRACT

Aseptic loosening is known to be the main limiting factor regarding prosthetic hip longevity. During the last two decades, divagating stem revision rates have been reported for cemented titanium stems, and their further use has been debated. Today cobalt chromium has widely replaced titanium in new cemented stem designs, but clinical evaluation is scarce.

In a prospective randomized study we compared two rough cemented stems with identical geometry, but different alloy (cobalt chromium versus titanium) using radiostereometry to investigate stem instability. Two years after surgery cobalt chromium stems were significantly more unstable than titanium in rotation, indicating that, for this particular stem design, cobalt chromium might be inferior to titanium. Further follow-up at 5–10 years will help determine if the increased early instability observed for cobalt chromium stems may affect stem longevity compared to titanium.

In the same study, periprosthetic bone mineral density was assessed using Dual-energy X-ray absorptiometry. One year after surgery, no significant differences in periprosthetic bone loss were found between the two groups, indicating that even this particular titanium stem, when inserted with cement, was too rigid to reduce periprosthetic bone loss.

The use of a cemented flanged cup has demonstrated superior survival regarding aseptic loosening, with the success mainly addressed to its ability to increase cement pressurization and thereby possibly also to improve cement penetration at the time of implantation. In an experimental study employing both ceramic acetabular models and paired cadaveric acetabuli we observed that flanged cups produced a significantly thicker cement mantle than unflanged cups did. However, no significant differences in cement penetration depths were found between the cups. The latter may indicate that the main penetration occurs during cement pressurization prior to cup insertion, and when it is time to insert the cup, the cement has turned too viscous to permit further penetration. The superior outcome often associated with flanged cups is therefore not likely to originate from improved cement penetration abilities, and alternative factors should be investigated.