

Commentary on: Ultrasonic cement removal in cement-in-cement revision total hip arthroplasty

WHAT IS THE EFFECT ON THE FINAL CEMENT-IN-CEMENT BOND?



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Due to the increasing burden of total hip joint arthroplasty,¹ there will continue to be an increase in revision surgery in the coming decades, even though revisions are gradually falling as a proportion of all primary hip joint arthroplasties.² The introduction of crosslinked polyethylene and ceramic-on-ceramic bearings has markedly reduced the revisions for loosening and lysis,^{3,4} which were commonly performed in the late decades of the 20th century and early 21st century due to wear of conventional polyethylene. Lysis was found around many cemented stems, which required removal of the cement prior to implanting a new prosthesis. Ultrasonic-driven tools, in conjunction with standard instruments to remove cement, became widely used. Although these tools were generally safe, complications have been reported.^{5,6} However, there has been an increasing use of cementless femoral fixation worldwide,^{4,7,8} and therefore cement removal prior to revision is now less frequently performed.

The experimental technique of cement-in-cement for revision hip arthroplasty was described by Greenwald et al⁹ in 1978, and the Exeter group has popularized cement-in-cement revision when femoral stem revision is required for reasons other than severe lysis with bony destruction.¹⁰ This is a reliable technique that has been used with other prostheses, and good outcomes have been reported from many centres.¹¹⁻¹⁴ As Liddle et al¹⁵ have stated, cement-in-cement revision can avoid some of the major complications that can occur when trying to remove all the cement at the time of revision surgery.

In order to prepare the femoral canal prior to inserting a stem into a well-fixed cement

mantle, surgeons have a number of options. They can use a burr, a broach of smaller sizes than the stem *in situ*, a robot,¹⁶ ultrasonic cement removal devices, or a combination. The aim of the paper by Liddle et al¹⁵ was to investigate the use of ultrasonic devices on the final cement-cement bond strength in a cement-in-cement model, as this has not been previously described.

The authors use a previously reported technique to examine the shear properties of polymethylmethacrylate mantles.¹⁷ Standard Stryker Simplex B Bone Cement (Stryker UK Ltd, Newbury, United Kingdom) was used with a total of 24 specimens, divided into three groups: a control group with no treatment to the cement mantle, a burr, and an ultrasonic device, Orthosonics System for Cemented Arthroplasty Revision (OSCAR; Orthosonics, Maidenhead, United Kingdom). After preparation of the specimens, a further cement mix was then poured into the cylinder, and 5 mm discs were prepared, ensuring that the temperature upon cutting did not exceed 25°C. Mechanical testing was then performed to determine the interfacial shear strength of the central portion of the newly cemented disc. The results were somewhat surprising, in that the ultrasonic group had a wide shear strength distribution and a significantly lower mean interfacial shear strength compared with both the control and burr groups. The authors also demonstrated an unusual porous zone not seen in the preparation by burr.

There are some issues with the methods used to test the interfacial shear strength in this mechanical model, as generally the vast majority of surgeons would be inserting a smooth polished tapered stem within the

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prepared well-fixed cement mantle, and this construct loads in compression. Therefore, this *in vitro* study may not reflect current clinical practice; however, it does call into question routine use of OSCAR, or other ultrasonic devices, in the preparation of a cement-in-cement revision. While they are extremely useful in removing distal cement plugs, this is needed far less frequently with the current taper slip design femoral stems in current widespread use. However, if a composite beam stem is utilized in a cement-in-cement revision, the use of ultrasonic tools may not be an appropriate method to prepare the cement mantle.

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