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## **Analysis of the taper supports retention of a well-fixed stem in revision surgery of metal-on-metal hip replacements**

**AK Matthies, P Bills, R Racasan, L Blunt, G Blunn, J Skinner, AJ Hart**

**Summary.** Retrieval analysis of metal-on-metal hip stems showed negligible wear ( $<1\text{mm}^3$ ) of the male taper surface in all cases. This supports retention of a well-fixed, undamaged stem during revision surgery

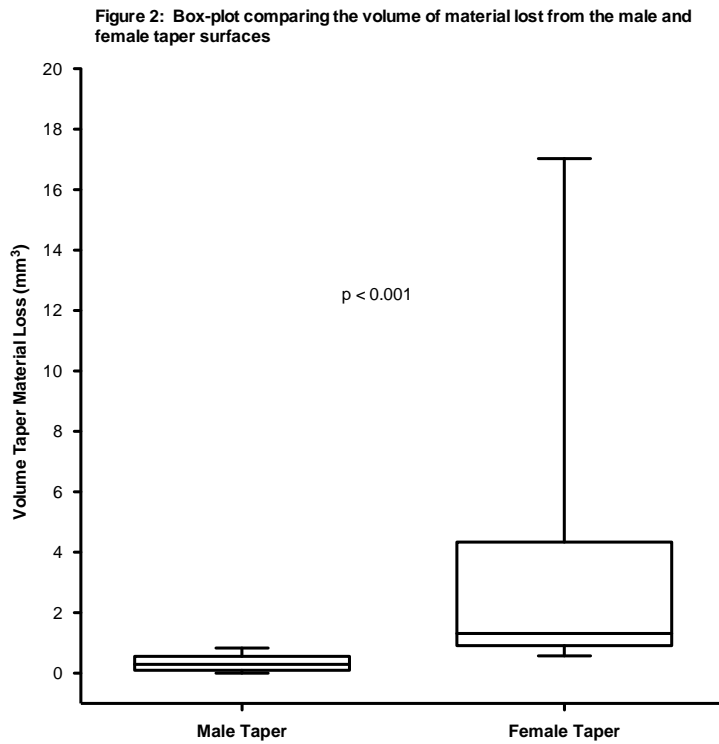
**Introduction.** Wear and corrosion at the taper junction of metal-on-metal total hip replacements (MOM-THR) is likely to contribute to the high revision rates reported by joint registries. Studies have shown significant volumes of measured material loss at the female taper surface (femoral head), but no study has reported data for the male taper surface (stem). The decision to retain a well-fixed stem at revision is uncertain, particularly in cases where the taper junction may be responsible for the need for revision surgery. This is an important consideration given the increasing burden of MOM revisions and the considerable increase in morbidity associated with revision of the stem. The purpose of this study was to measure the volume of material loss of both the 'female' and 'male' taper surfaces and determine the relative contribution of each to the total material loss at the taper junction.

**Methods.** This was a retrospective study of 90 retrieved components from revision surgery of large diameter MOM-THR, in which revision included removal of the stem. The series included four contemporary metal-on-metal bearing designs and six different stem designs. We recorded all commonly reported clinical data. We then measured the volume of material loss from each of the taper and bearing surfaces using a validated method. Additionally, each of the taper surfaces were examined microscopically and corrosion was graded according to a well-published four-tiered classification.

**Results.** The median volume of material lost from the male taper surface was  $0.29\text{mm}^3$  (0.00 - 0.83). This was significantly less than the median volume of material lost from the female taper surface ( $p < 0.001$ ), which was  $1.31\text{mm}^3$  (0.57 - 17.03). These results are shown in Figure 1. On average, the 'male' taper contributed 6.1% (0.00 - 31.53) of the total material loss at the taper junction, and in all cases was deemed negligible ( $< 1\text{mm}^3$ ). The bearing surfaces contributed a significantly greater volume of material than both taper surfaces combined ( $p < 0.001$ ). Similar results were found for corrosion scores, with significantly fewer male taper surfaces demonstrating evidence of corrosion compared to the female taper surfaces (Figure 2).

**Discussion/Conclusions.** The taper junction is a clinically relevant source of metal debris in MOM-THR. However, the predominant source of taper material is the female surface (inside the femoral head), and we have shown that the male surface (stem-neck) contributes only negligible volumes of material ( $< 1\text{mm}^3$ ). Further qualitative assessment confirmed the absence of significant corrosion on the male taper surfaces. Although limited to few cases, this data supports retention of a well-fixed macroscopically undamaged stem at revision surgery in patients with problematic MOM-THR. These are clinically significant findings given the increasing burden of revision surgery and the increased morbidity and complexity associated with revising a well-fixed femoral stem.

**Figure 1.** Box-plot comparing the volume of material lost from the male and female taper surfaces ( $p < 0.001$ ).



**Figure 2.** Box-plot comparing corrosion scores for the male and female taper surfaces. A significantly higher greater proportion of female taper surfaces exhibited evidence of at least mild corrosion ( $p < 0.001$ ).

Figure 3: Box-plot comparing corrosion scores for the male and female taper surfaces. A significantly higher proportion of female taper surfaces exhibited evidence of at least mild corrosion ( $p < 0.0001$ )

