O 586. COMPARISON OF WEAR AND DAMAGE CAUSED BY BONE CEMENTS WITH BARIUM SULPHATE AND ZIRCONIA RADIOPAQUE ADDITIVES

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Purpose The damage caused to metallic femoral heads and the fretting volume at the stem/cement interface were determined for two different bone cements, one containing barium sulphate radiopaque additives and one containing zirconia radiopaque additives.

Materials and Methods Third body damage to stainless steel femoral heads was investigated in two different laboratory models. In the first model six pins from each bone cement were slid for over 50,000 cycles against a polished stainless steel counterface in a biological lubricant. Surface damage was determined by 2D and 3D profilometry. In the second model particles from the two types of bone cement were embedded in polythlene pins which were slid on the polished metal counterfaces and the damage caused by the bone cement particles assessed by profilometry. Fretting wear at the bone cement stem interface was modelled with low amplidude (0.5mm) cyclic fretting between the bone cement pins and the stainless steel counterfaces.

Results The damage tests (sliding and third body) showed significantly more damage caused by the bone cement with zirconia additives compared to barium sulphate additives.

n=8	Zirconia Mean ±SE μm	Barium Sulphate Mean ± SE μm
Counterface damage in sliding R_a	0.42±0.08	0.02±0.005
Third body damage. Cummulative depths of valleys/mm	1.75±0.23	0.5±0.5

The fretting wear test showed significantly greater wear for the cement with zirconia additives.

n=6	Zirconia Mean ±SE mm^3	Barium Sulphate Mean ± SE mm^3
Wear volume metal	5.5±0.5	0.2±0.1
Wear volume cement	0.52±0.05	0.14±0.02

Conclusion The laboratory studies showed that bone cement with zirconia radiopaque additives such as 'Palacos' can cause more third body damage to the femoral head than cement containing barium sulphate additives such as CMWIRO or Simplex. This third body damage can increase wear of the polyethylene acetabular cup. At the stem cement interface fretting wear caused by micromotion is predicted to be greater for the cement containing zirconia radiopaque additives.