

WHY THE BENEFIT OF CERAMIC HEADS IS NOT DEMONSTRATED BY RADIOGRAPHIC WEAR STUDIES

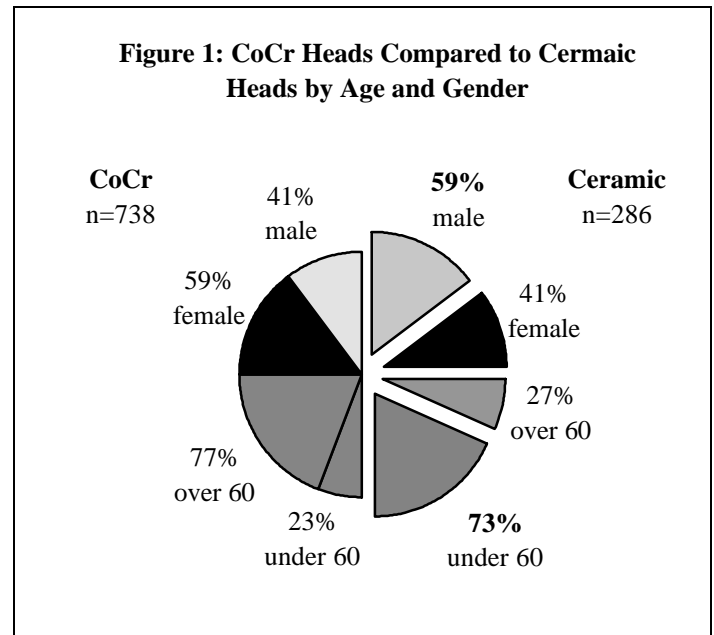
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Femoral heads made of ceramic material have increased hardness with the potential for a smoother finished surface and ceramics demonstrate better wettability for improved lubrication. These advantages have not, however, been completely accepted because ceramic heads have not consistently demonstrated lower polyethylene wear rates in radiographic studies.

Methods: This was a retrospective study of 1,024 hips implanted by 11 different surgeons, with a minimum of two years of radiographic follow-up (mean of 3.1 years and maximum of 5.5 years). All hips had a Duraloc (DePuy, Warsaw, IN) modular, cementless acetabular component. Anteroposterior radiographs of the pelvis were digitized and wear was measured by the same two investigators, using a two-dimensional computer-assisted technique. Alumina ceramic heads were used in 28% of hips (N=286).

Results: The mean age of patients with a ceramic femoral head was 52 years (range, 25-75) and 59% were male. The mean age of patients with a cobalt chromium alloy femoral head was 65 years (range, 16-89) and only 41% were male. Patients receiving ceramic heads were, on average, 13 years younger ($p<0.001$) and were predominantly male ($p<0.001$). Linear regression analysis of all 1,024 hips indicated that male gender and age <60 years were associated with an increased wear rate of 37 and 33%, respectively ($p<0.001$). Comparing raw wear rates, ceramic heads were associated with only a 10 to 15% reduction in wear. However, ceramic heads were selectively used in younger patients and males. Linear regression analysis indicates that, after correction for differences in the identified covariates, ceramic heads were associated with a 30% reduction in wear rate ($p<0.001$).

Discussion: With this large retrospective study, it was our intent to obtain a sample of community practice. There was clearly surgeon selection bias for the use of ceramic heads in younger patients and males, those likely to be more active (**Figure 1**). As in other radiographic studies, wear rate was assessed using a denominator of time. Wear is not a function of time, but a function of use. Pedometer studies indicate that males, <60 years of age, are about 40% more active than other patients. Because they are used in patients with higher activity levels, hips with ceramic heads are exposed to a higher amount of use (more cycles) in a given time period. With this large data base, linear regression analysis could be used to adjust for multiple covariates, such as age and gender. Ceramic heads were actually associated with a 30% reduction in wear rate, which is not only statistically significant, but practically significant.



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