Oxidized Zirconium vs. Cobalt Chrome Femoral Heads in Total Hip Arthroplasty: A Multicenter Prospective Randomized Controlled Trial with 10 Years Follow Up

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INTRODUCTION:
This study reports the 10-year polyethylene liner wear rates, incidence of osteolysis, clinical outcomes, and complications of a three-arm, multicenter randomized controlled trial comparing Cobalt-Chrome (CoCr) and Oxidized Zirconium (OxZr) femoral heads with ultra-high molecular weight polyethylene (UHMWPE) vs. highly cross-linked polyethylene (XLPE) liners in total hip arthroplasty (THA).

METHODS:
Patients undergoing THA from four institutions were prospectively randomized into three groups. Group A received a CoCr femoral head and XLPE liner; Group B received an OxZr femoral head and XLPE liner; and Group C received an OxZr femoral head and UHMWPE liner. Patients and observers recording study outcomes were blinded to the treatment groups at each follow-up interval. The outcomes of 262 study patients were analyzed at 10 years follow up after THA.

RESULTS:
At 10 years follow up, increased linear wear rates were recorded in group C compared to group A (0.133 ± 0.21 mm/yr vs. 0.031 ± 0.07 mm/yr respectively, p<0.001) and group B (0.133 ± 0.21 mm/yr vs. 0.022 ± 0.05 mm/yr respectively, p<0.001). Patients in group C were associated with increased risk of osteolysis and aseptic loosening requiring revision surgery compared with group A (7/133 vs. 0/133 respectively, p=0.007) and group B (7/133 vs. 0/135 respectively, p=0.007). There was a non-significant trend toward increased liner wear rates in group A compared to group B (0.031 ± 0.07 mm/yr vs. 0.022 ± 0.05 mm/yr respectively, p=0.128). All three groups were statistically comparable preoperatively and at 10 years follow up when measuring normalized Western Ontario and McMaster Universities Osteoarthritis Index (p=0.410), short-form-36 (p = 0.465 mental, p = 0.713 physical), and pain scale scores (p=0.451).

DISCUSSION AND CONCLUSION:
This multicenter prospective randomized controlled study found the use of UHMWPE was associated with increased rates of linear polyethylene wear and increased risk of osteolysis requiring revision THA compared with XLPE. These findings suggest that the XLPE acetabular liner remains the most important factor for minimizing component wear and risk of osteolysis following THA. Femoral heads composed of OxZr were associated with a non-significant trend toward reduced wear rates compared to CoCr, but this did not translate to any differences in osteolysis, functional outcomes, or revision surgery between the two treatments groups.