The association between highly crosslinked versus conventional polyethylene for total knee arthroplasty and revision risk out to 20-years follow-up

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INTRODUCTION:
While studies have found highly crosslinked polyethylene (HXLPE) to be associated with a lower revision risk compared to conventional polyethylene (CPE) in total hip arthroplasty, evidence of any benefit in implant performance for total knee arthroplasty (TKA) is lacking. The purpose of the present study was to evaluate revision risk out to 20-years follow-up for HXLPE versus CPE in primary TKA.

METHODS:
Data from a US-based healthcare system's Total Joint Replacement Registry was used to conduct a cohort study. Adult patients who underwent primary TKA including the patella for the indication of osteoarthritis between 2001-2022 were included. To minimize confounding due to implant factors, the study sample was restricted to fixed bearing TKA using cobalt-chromium alloy on HXLPE (CoCr-HXLPE) and CoCr-CPE bearings; only posterior stabilized or minimally stabilized designs were included. The HXLPE group included all materials other than conventional polyethylene, including with and without antioxidants. The primary outcome was all-cause revision out to 20-years follow-up; aseptic revision was a secondary outcome. Multivariable Cox proportional hazards regression was used to evaluate revision risk by treatment group. Age, body mass index (BMI), sex, race/ethnicity, ASA classification, bilateral procedure, cement utilization, implant stability, high flexion implant design, operative time, and average annual surgeon volume as covariates. Hazard ratios (HR) and 95% confidence intervals (CI) are presented. $p<0.05$ was considered statistically significant.

RESULTS:
The final study sample included 198,021 primary TKA: 47,370 CoCr-HXLPE and 150,651 CoCr-CPE. Mean age and BMI for the cohort was 68 years and 31.6 kg/m2, respectively. Most patients were female (61.5%) and White race (68.8%). At 20-years follow-up, the crude cumulative incidence of all-cause revision for CoCr-HXLPE was 6.3% and 6.2% for CoCr-CPE (Figure); aseptic revision incidence was 4.4% and 4.1% for CoCr-HXLPE and CoCr-CPE, respectively. In adjusted analyses, no differences were found in risk of all-cause revision (HR=0.94, 95% CI=0.88-1.01) or aseptic revision (HR=0.95, 95% CI=0.87-1.03) when comparing CoCr-HXLPE bearings with CoCr-CPE. When looking at specific reasons for those who had a revision during follow-up, 3.4% vs 2.9% of CoCr-HXLPE and CoCr-CPE, respectively, underwent revision for liner wear, 2.6% vs 4.3% underwent revision for osteolysis.

DISCUSSION AND CONCLUSION:
In this registry-based cohort study, no differences were observed for CoCr-HXLPE versus CoCr-CPE following TKA. Further study is needed to understand variations in HXLPE given the difference that exist across manufacturers.

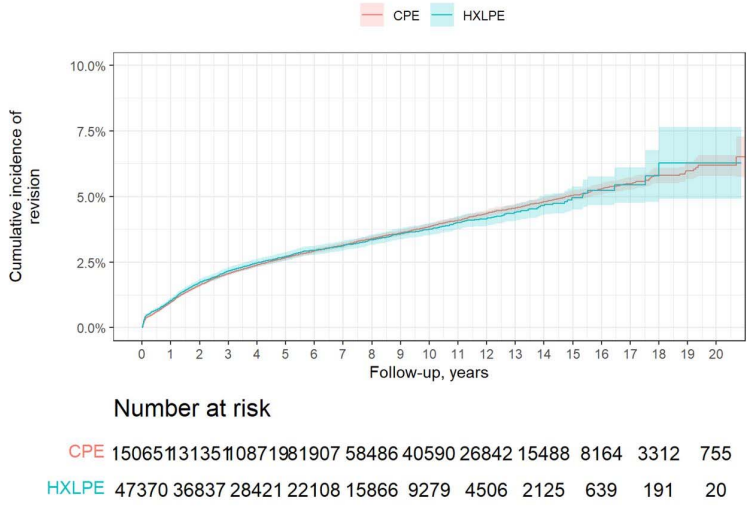

Figure.