Oxidized Zirconium vs Cobalt-Chromium TKA: Surface roughness of retrieved femoral components

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Introduction
• Oxidized zirconium (OxZr) was introduced as an alternative bearing surface to CoCr alloys in TKAs
• Simulator studies have shown that the surface roughness of OxZr does not change during testing, while the surface roughness of CoCr increases \(^1\)
• Retrieval studies have shown that PE components paired with OxZr have less surface damage than those paired with CoCr femoral components \(^2\)
• While in vivo performance of CoCr is well established, little is known about the in vivo performance of OxZr \(^3\)

Objective
To evaluate the surface characteristics of OxZr and CoCr retrieved TKA femoral components

Methods

Qty – 10 OxZr Retrieved femoral components
Qty – 10 CoCr Retrieved femoral components

Implants matched on patient demographics: LOI, Age, Revision Diagnosis and BMI

Surface roughness measured with non-contact white light profilometer
(MicroXAM Optical Profiler, ADE Phasishift, AZ)

Statistical Analysis: General Estimating Equations (GEE) models were developed to estimate the differences in roughness between the materials.
Results

- Scratching visible on CoCr retrievals, while little is seen on retrieved OxZr components
- The CoCr implants roughened significantly more in vivo than the OxZr components
- The average surface roughness for the retrieved CoCr was 83% greater than the OxZr retrieved components

3D surface profiles of Oxidized Zirconium and Cobalt-Chromium femoral components

Conclusions

- Increased surface roughness with CoCr could impact the in vivo adhesive and abrasive PE wear mechanisms
- Understanding the surface roughness of the bearing material can help explain the damage seen in vivo
- A smoother surface, such as OxZr, with superior wear properties is an ideal bearing surface for a TKA

* Median values reported for roughness parameters. All values in μm.
References

Acknowledgements
Clark and Kirby Foundations, and The Trump Institute for Implant Analysis. This work made use of the Cornell Center for Materials Research Shared Facilities which are supported through the NSF MRSEC program (DMR-1120296).