**BACKSIDE POLYETHYLENE WEAR OF MODULAR TIBIAL INSERTS**

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**Introduction:** The use of modular tibial components in total knee arthroplasty introduces a possible source of polyethylene wear debris at the non-articulating (backside) surface. However, it is not known whether this phenomenon is an incidental finding, observed in unique specimens or whether it is a feature common to all modular components. The purpose of this study was to determine the type and severity of backside wear in retrieved tibial inserts of several common designs.

**Materials and Methods:** Eighty-one polyethylene tibial inserts were retrieved at revision TKR after implantation periods ranging from 0 to 180 months. Fourteen different implant designs were examined: the Insall-Burstein II (Zimmer, n=27), the MG I (Zimmer, n=11), the AMK (Depuy, n=8), the MG II (Zimmer, n=5), the Natural Knee I (Sulzer, n=5), the Duracon (Howmedica, n=4), the Genesis I (Smith & Nephew, n=4), the PCA (Howmedica, n=4), the Series 7000 (Osteonics, n=4), the Apollo (Sulzer, n=3), the NexGen (Zimmer, n=3), the Ortholoc (Dow Corning Wright, n=3).

Each of the polyethylene inserts was visually inspected using a stereomicroscope (32X). Seven different modes of surface damage were evaluated in 4 quadrants defining the backside surface. A visual score of 1 to 10 was assigned to quantify damage severity. Where feasible, cold flow was determined by measuring the depth of extrusion into the screw holes in the metal tibial baseplate.

**Results:** Pitting and burnishing were observed on the backside of polyethylene inserts in designs with a variety of different capture mechanisms. Across all implant designs, pitting was observed in 90% of the retrievals, burnishing in 65% and cold flow in 61%. Average severity scores and cold flow values for each of the designs are given in the charts below. Correlation analysis revealed that longer in situ time is associated with increased cold flow (Fisher's r to z transformation, p<0.05), but not with pitting or burnishing (p=0.33, p=0.77). In addition, there were no correlations between patient height and weight and any wear patterns. Burnishing, pitting and cold flow were all more severe on the medial side of the implant (p<0.05).

Some designs did exhibit significantly more severe backside wear than others. The AMK showed more cold flow and the IB II showed more severe burnishing, while the MG I and the MG II showed significantly less severe pitting than the other designs (ANOVA, p<0.05; Fisher’s PLSD, p<0.05).

**Discussion:** Significant wear of the non-articulating surface of polyethylene tibial inserts is frequently observed in all designs of knee prostheses, independent of the capture mechanism designed to immobilize the polyethylene insert. While longer implantation times produces greater cold flow, both pitting and burnishing occur in implants of all in situ times. The wear patterns observed in the retrieved specimens suggest that backside wear may be an important factor contributing to osteolysis in some knee designs. Our results indicate that new designs of modular tibial components are needed to prevent generation of polyethylene wear debris at the non-articulating surface of total knee replacements.

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