*Title*

# IMPROVED RESISTANCE TO WEAR, DELAMINATION, AND POSTERIOR LOADING FATIGUE DAMAGE OF ELECTRON BEAM IRRADIATED, MELT-ANNEALED, HIGHLY CROSSLINKED UHMWPE KNEE INSERTS

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*Publication*
Standard Technical Publication 1445. ASTM International. 2004

*Purpose/Premise*
This article reports on a study performed to evaluate the wear and delamination resistance, and fatigue performance of tibial articular surfaces made with electron-beam irradiated and melt-annealed highly crosslinked polyethylene compared to components made with conventional polyethylene.

*Material and Methods*
All samples were subjected to accelerated aging, and the average surface oxidation index (SOI) was measured. The components were then tested in wear simulators to five million and twenty million cycles. Posterior load fatigue testing and delamination testing were also performed.

*Outcomes*
The highly crosslinked samples showed significantly less wear than control samples that were gamma sterilized. All of the gamma control samples experienced significant delamination, while none of the highly crosslinked samples exhibited signs of delamination even after eight million cycles. The control samples also showed signs of fatigue damage while none of the highly crosslinked samples exhibited fatigue damage. The highly crosslinked samples also showed significantly more resistance to oxidation.

*Conclusion/Recommendation*
The authors conclude that electron-beam irradiated and melt-annealed highly crosslinked polyethylene is significantly more resistant to wear, delamination, and fatigue damage compared to conventional gamma irradiated polyethylene. They also conclude that the melt-annealing process eliminates the measurable free radicals that are generated during the crosslinking process, and that this results in improved resistance to oxidation.

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