

**EVALUATION OF STRUCTURAL MODIFICATION
OF CONVENTIONAL AND CROSSLINKED PE-UHMW
ACETABULAR LINERS AFTER IN-VIVO USE**

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Ultra-high molecular weight polyethylene (PE-UHMW) has been used for decades as articulating material in total joint replacement [1]. Depending on the manufacturer different designs and types regarding molar mass, state, sterilization method and thermal treatment are used. Morphology and chain structure of the implants can therefore differ. In addition, material non-specific factors such as age, activity level, weight, etc. influence the aging behavior and complicate its comparability. By evaluation of 19 acetabular liners (crosslinked and conventional gamma-sterilized PE-UHMW) with various in vivo durations, material specific parameters are determined and correlated.

Failure analysis of the liners is performed according to [2] in terms of optical damage scoring. A depth profile over the cross-section is prepared by slices microtomed parallel to the surface. The mechanical properties are determined by using depth sensing indentation testing. FTIR spectra give semi-quantitative information on the local distribution of oxidative changes. Changes in morphology are detected by calculating the degree of crystallinity and lamellar thickness distribution.

After longer in-vivo time damage score increase as well as severity of damages. Morphology and mechanical properties of the liners are affected by in-vivo time. Correlations of chemical constitution and morphology with micro-mechanical properties are found, as well as diffusion of biomolecules into the amorphous regions (as reported in [3]). Crosslinking reduces crystallinity and modulus of elasticity, although differences due to thermal treatment are apparent. What is more, no influence of age or weight was found. The influence of sex on implanted acetabular liners will be further investigated.

References

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