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Scientific Exhibits

Effect of Guided Knee Motion and High Flexion TKA on Kinematics, Implant Stresses, and Wear

Scientific Exhibit Number: SE33 Location: McCormick Place Hall B

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Simulation of guided motion TKA indicates that more normal kinematics are achieved while implant stresses and wear are not increased.

Guided motion TKA designs which allow for controlled rotation and rollback during flexion may permit kinematics similar to the healthy knee. However, adding constraint of a cam/post mechanism or guiding kinematic motion with the articular geometry may affect UHMWPE stresses and wear. The purpose of this study was to evaluate knee kinematics, UHMWPE stresses, and wear associated with a guided motion design.

Knee kinematics and kinetics were assessed using a virtual lower leg simulator (**LifeMOD/KneeSIM** - dynamic kinematic analysis). The kinematics were compared to 3D MRI data of healthy knees. Contact pressures in the UHMWPE insert were determined (FEA) for ideal alignment and for the range of mal-alignments typically observed clinically. Wear rates were studied in a wear simulator using established kinematic inputs. The wear rate of the guided motion knee was compared to a conventional P/S TKA.

Analysis of the guided motion knee showed kinematics similar to the MRI data of healthy knees, and reduced patellofemoral shear forces and wear rate compared to the conventional P/S design. Contact pressures during mal-alignment were within 10±10% of the optimal condition.

Testing indicated that more normal kinematics are achieved by modifications in articular geometry and cam/post mechanisms. Reduced patellofemoral shear forces were associated with sustained femoral external rotation in deep flexion. Implant stresses and wear did not increase with guided motion TKA.