

Scientific Exhibit No. SE23

### **Late versus Early Engagement of Posterior Stabilized Prostheses: Effect on Extensor Moment Arm and Resultant Extensor Loads**

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Two mathematical posterior stabilized knee models were constructed to investigate the effects of late versus early engagement of the cam-post mechanism on femoral rollback and extensor mechanism forces.

Recent studies have shown that anterior femoral translation can occur during early and mid flexion with PS knee designs. The anterior femoral translation is not physiological and may have detrimental effects, including decreased quadriceps moment arm with corresponding reduction in quadriceps efficiency and accelerated polyethylene wear. It is hypothesized that an early engaging cam-post mechanism introduces femoral rollback during early degrees of flexion and will prevent the femoral from sliding forward, thereby maintaining a greater quadriceps moment arm. Two mathematical virtual knee models of similar design were constructed; one with early and one with late cam-post engagement. Three-dimensional kinematics, contact forces, and tissue forces were analyzed during a simulated deep knee bend (0-110° flexion). The early engaging model had cam-post contact at 20° of flexion, whereas the late engaging model had cam-post contact at 65° of flexion. The tibiofemoral contact point moved to a more anterior location with the late engaging model. The anterior shift was associated with an approximate 20% increase in quadriceps force and an increased patellofemoral normal force. Early engagement of the cam-post mechanism aided in the maintenance of a posterior position of the tibiofemoral contact point, which increased the extensor moment arm, resulting in lower patellofemoral forces. Early investigation suggests that a relationship exists between early versus late engagement of the post and cam and the resulting forces through the extensor mechanism.