Getting to Zero...with the Abaqus Knee Simulator

Accelerating the design of knee implants

The Abaqus Knee Simulator provides orthopedic device manufacturers with the tools necessary to deliver innovative, safe, and effective knee implant designs to patients in a fraction of the time.

IMPROVE
design confidence and reliability

It is estimated that nearly 1.5 million knee arthroplasty (replacement) surgeries will take place globally in 2013. As this number continues to rise, orthopedic device companies involved with designing, testing, and manufacturing knee implants will be expected to accelerate design cycles and patient care to meet the increasingly demanding market needs.

The Abaqus Knee Simulator vs. physical testing

In the past, orthopedic device manufacturers have relied heavily on numerous in vitro tests to assess the performance of a device based on new design parameters. However, the evaluation of orthopedic implants, such as total knee replacement (TKR), under physiological loading conditions has been difficult to achieve using these traditional testing methods. Physical simulators, such as the Kansas Knee Simulator, have required a cadaver knee joint and a complex loading apparatus to mimic the in vivo conditions. This type of testing is too expensive and time consuming to be a practical device evaluation tool.

The Abaqus Knee Simulator was developed to address this issue and provide knee implant designers with five easy-to-use workflows to explore a variety of different designs in less time and at a fraction of the cost. More importantly, the Abaqus Knee Simulator is based on validated model data, so the designs will be safer and more effective for patients.

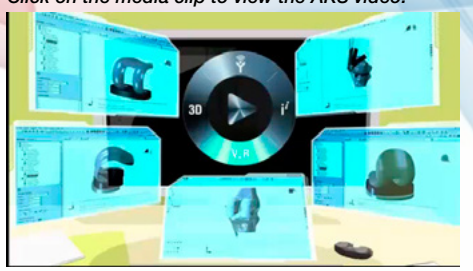
Workflows

The Abaqus Knee Simulator suite of five semi-automated tools perform a series of knee simulations of varying complexity, from simulating basic contact to general activities of daily living, all which address:

1. **Contact Mechanics:** Evaluate tibiofemoral contact mechanics at static positions throughout flexion
2. **Implant Constraint:** Measure laxity between femoral and tibial components in the absence of soft tissue structures
3. **Tibiofemoral Constraint:** Measure laxity of the tibiofemoral joint with soft tissue
4. **Wear Simulator:** Predict wear on the tibial insert over a number of gait cycles
5. **Basic Total Knee Replacement Loading:** Evaluate whole joint mechanics during activities of daily living under basic muscle loaded conditions

The five simulation workflows were developed with a custom interface to allow easy conversion from rigid to deformable structures, adjustment of mechanical properties and component alignment, editing of material properties and boundary conditions, and presentation of simulation results.

Click on the media clip to view the AKS video.



Designer and analyst applications guide users from model creation to results interpolation.

For More Information

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