FEM of a Bone Preserving Implant
TSI™
Tissue Sparing Implant

Sponsored by Joint Implant Surgery and Research Foundation

JISRF internal report
2008 performed by Exponent, Inc.
Visible Human Project - Digital image dataset of complete human male and female cadavers in MRI, CT and anatomical modes
Models

Intact

Short Stem TSI™

Long Stem AML® style

484,748 elements

510,344 elements

760,502 elements
Short TSI™ Stem
Size 4
Long Stem
Implant Placement and Fixation
Short TSI™ Stem

Fixed
Friction
Frictionless
Implant Placement and Fixation

Long Stem

Fixed

Frictionless

0 HU  800 HU  1600 HU
Loads and Boundary Conditions

Peak Gait

784 N (1.0x BW)
abductor and tensor fascia lata muscle loads

1783 N (2.4x BW)
Peak gait load (level walking)

710 N (0.9x BW)
vastus lateralis muscle load

Distal femur fixed

[Heller et al., J. Biomech, 2005]
von Mises Stress
Peak Gait

Intact  Short TSI™ Stem  Long Stem

0 MPa  5 MPa  10 MPa
von Mises Strain
Peak Gait

Intact

Short TSI™ Stem

Long Stem
Remodeling Stimulus
Peak Gait

Short TSI™ Stem

Long Stem
Remodeling Stimulus
Peak Gait

Short TSI™ Stem

Biodynamic*

*different donor
Discussion

- Less bone resorption for short TSI™ stem vs. long AML® style stem
- Less bone resorption for short TSI™ stem vs. Biodynamic
- Other factors
  - Single donor
  - Undersizing effects unknown
  - Positioning effects unknown