Computational Stress and Deformation Analysis of Mammary Prosthesis

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(ABSTRACT)

A linear and non-linear material model for the breast implants was developed through axial tension testing, while linear and non-linear breast tissue models were assumed based on smooth muscle. These material models were to develop axisymmetric finite element models to determine the stresses in the implant walls under tissue loading. The non-linear material models were used to more accurately model the complex nature of the implant stresses. After analysis it was found that the implants were under compressive loading which meant that local buckling in the implant might be possible.

For accurate stress prediction in the implant walls and to fully characterize implant buckling a more accurate non-linear breast tissue material model needs to be developed. Having this material model would allow for a full three-dimensional finite element model can be developed. With the development of a three-dimensional FEA model the implant buckling and implant stresses could be fully characterized. Ultimately allowing for accurate implant stress estimation and fatigue life calculation using the Palmgren-Miner rule, S-N curves, and an external load spectra.

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