

## Finite Element Modeling of Residual Stresses in Blood Vessels

It has been shown that excised blood vessels contain small, but significant residual stresses and strains. This phenomenon is potentially important when attempting to determine how soft tissues grow and remodel when subject to altered stress states because the existence of residual stress implies a non-zero stress resting condition. Further implications may extend to tissue-engineered cell populations and eventual grafting or implantation procedures since cells grown in culture dishes are at a zero-stress resting state. This project proposes to engage the student in the development of potential modeling strategies intended to simulate residual stress and/or strain in vessel walls, with validation based on reported literature findings. The techniques developed may have future application in a number of ongoing studies. The project will require that AbaqusCAE, a finite element package front end, be learned and implemented. The student will build and analyze simple models of vessel wall sections, then investigate loading strategies or other modeling features to simulate existing residual stress experiments. Academic training in finite element analysis theory is not required, but because coursework will extend the results of the project, preference will be given to students demonstrating such academic interest.

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