STRESS QUANTIFICATION IN STENTED HYPERELASTIC ARTERY MODELS: TOOLS FOR IMPROVING STENT DESIGN AND REDUCING RESTENOSIS

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ABSTRACT

Atherosclerosis is the leading cause of death in developed countries. Minimally invasive procedures utilizing catheter-based delivery systems are promising therapies, but those employing endovascular prosthetics such as stents, can initiate a cascade of events resulting in neointimal hyperplasia and restenosis. The presence of a relatively rigid and oversized (at least 10% larger than the healthy lumen size during systole) stent induces significant stress concentrations in the vessel wall. It is hypothesized that these stress concentrations play a significant role in the activation of processes culminating in restenosis. With the impetus to reduce morbidity and mortality produced by stent implantation, the finite element method was used to quantify how the stress environment in the artery is altered upon stent implantation. The specific aim of this work was to identify important stent design parameters and examine their influence on the stress distribution in the artery wall. Optimization of these design parameters may lead to the identification of a stent configuration that minimizes the stress induced in the artery.

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