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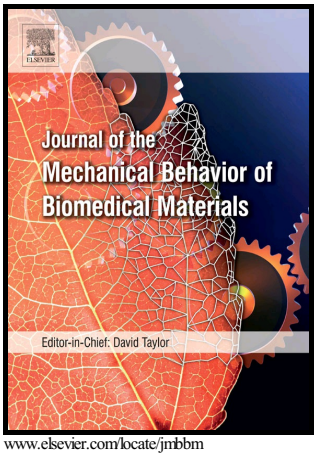

www.elsevier.com/locate/jmbbm

PII: S1751-6161(18)30846-4
DOI: https://doi.org/10.1016/j.jmbbm.2018.07.020
Reference: JMBBM2888

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 30 May 2018
Revised date: 10 July 2018
Accepted date: 12 July 2018

Cite this article as: Raja Jayendiran, Bakr Nour and Annie Ruimi, Fluid-structure interaction (FSI) analysis of stent-graft for aortic endovascular aneurysm repair (EVAR): material and structural considerations, *Journal of the Mechanical Behavior of Biomedical Materials,* https://doi.org/10.1016/j.jmbbm.2018.07.020

Fluid-structure interaction (FSI) analysis of stent-graft for aortic endovascular aneurysm repair (EVAR): material and structural considerations

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Abstract

The effect of hemodynamic load on various stent-graft designs used for endovascular aneurysm repair (EVAR) in cardiovascular treatments is studied using a numerical fluid-structure interaction (FSI) analysis that couples computational fluid dynamics (CFD) and finite element analysis (FEA). Radial displacements, mechanical stresses, wall shear stress and wall compliance quantities are evaluated for four stent materials and one graft material. The strut thickness is varied from 0.3 mm to 1 mm. The materials are assumed linearly elastic and isotropic while blood is assumed as a Newtonian and incompressible medium with a pulsatile and turbulent flow profile. Time dependent pressure conditions are assumed at the inlet and outlet. Results are benchmarked against a study taken from the literature and indicate that the stent material and the strut thickness greatly influence the mechanical behavior of the structure. This computational study will serve as an additional tool to vascular surgeons when assessing the choice of material and design for stent-graft recipients.

Key words: Stent-graft, Fluid-Structure Interaction, Endovascular repair, Wall shear stress