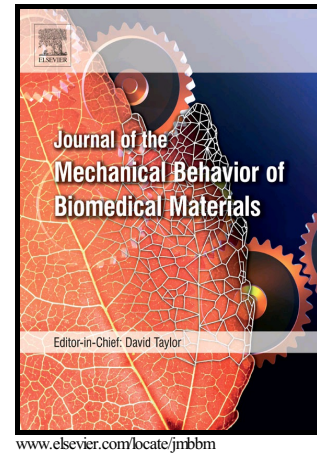


# Author's Accepted Manuscript

A Comparison of the Material Properties of Natural and Synthetic Vascular Walls

Forough Askari, Mehdi Shafieian, Atefeh Solouk, Ata Hashemi



PII: S1751-6161(17)30126-1  
DOI: <http://dx.doi.org/10.1016/j.jmbbm.2017.03.016>  
Reference: JMBBM2269

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

Received date: 24 October 2016  
Revised date: 12 March 2017  
Accepted date: 22 March 2017

Cite this article as: Forough Askari, Mehdi Shafieian, Atefeh Solouk and Ata Hashemi, A Comparison of the Material Properties of Natural and Synthetic Vascular Walls, *Journal of the Mechanical Behavior of Biomedical Materials* <http://dx.doi.org/10.1016/j.jmbbm.2017.03.016>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

Forough Askari, Mehdi Shafieian<sup>\*</sup>, Atefeh Solouk, Ata Hashemi

Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

<sup>\*</sup>Corresponding Author: Assistant Professor, Amirkabir University of Technology (Tehran Polytechnic), 424 Hafez Ave, Tehran, Iran, 15916-34311, 1591634311. Tel: +98 21 6454 2359; Fax: +98 21 6646 8186. shafieian@aut.ac.ir

## Abstract

Characterization of the mechanical properties of native and synthetic vascular grafts is an essential task in the process of designing novel vascular constructs. The aim in this study was to compare the mechanical behavior of ovine left Subclavian artery with that of POSS-PCU (a commercial biomaterial which is currently under clinical investigation. ClinicalTrials.gov Identifier: NCT02301312). We used Delfino's strain energy potential within the framework of quasilinear viscoelasticity theory to capture the viscoelastic response of the considered materials. The material parameters of the quasilinear viscoelastic constitutive equation were determined through a combination of experimental and computational method. First, a uniaxial tensile testing device was used to perform a series of stress relaxation tests on ring samples. Then, the derived quasilinear viscoelastic models were implemented into finite element system. With the aid of mechanical experimentation and finite element simulation, the material parameters were obtained, modified and used for comparison of the mechanical properties of vascular walls. The results showed that the stiffness and the long term viscoelastic parameters of POSS-PCU may lead to different stress responses of the vascular walls. These two factors can be improved by modifications in manufacturing parameters of the synthetic vessel.

Graphical abstract

Download English Version:

<https://daneshyari.com/en/article/5020583>

Download Persian Version:

<https://daneshyari.com/article/5020583>

[Daneshyari.com](https://daneshyari.com)