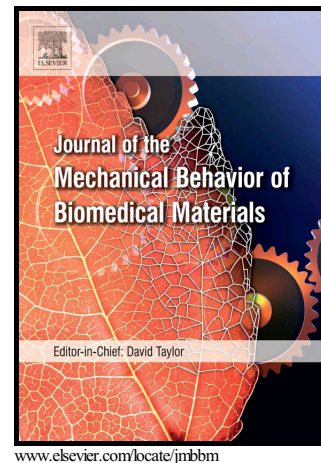


Author's Accepted Manuscript

Evaluation of Transcatheter Heart Valve Biomaterials: Biomechanical Characterization of Bovine and Porcine Pericardium

Andrés Caballero, Fatiesa Sulejmani, Caitlin Martin, Thuy Pham, Wei Sun



PII: S1751-6161(17)30356-9

DOI: <http://dx.doi.org/10.1016/j.jmbbm.2017.08.013>

Reference: JMBBM2457

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

Received date: 28 June 2017

Revised date: 3 August 2017

Accepted date: 8 August 2017

Cite this article as: Andrés Caballero, Fatiesa Sulejmani, Caitlin Martin, Thuy Pham and Wei Sun, Evaluation of Transcatheter Heart Valve Biomaterials: Biomechanical Characterization of Bovine and Porcine Pericardium, *Journal of the Mechanical Behavior of Biomedical Materials*, <http://dx.doi.org/10.1016/j.jmbbm.2017.08.013>

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.

Evaluation of Transcatheter Heart Valve Biomaterials: Biomechanical Characterization of Bovine and Porcine Pericardium

Andrés Caballero¹, Fatiesa Sulejmani¹, Caitlin Martin, Thuy Pham, Wei Sun*

Tissue Mechanics Laboratory, The Wallace H. Coulter Department of Biomedical Engineering, Georgia Institute of Technology and Emory University, Atlanta, GA

*Correspondence to: 206 Technology Enterprise Park, Georgia Institute of Technology, 387 Technology Circle, Atlanta, GA 30313-2412. Tel.: +404 385 1245. wei.sun@bme.gatech.edu

Abstract

Objective

Bovine pericardium (BP) has been identified as a choice biomaterial for the development of surgical bioprosthetic heart valves (BHV) and transcatheter aortic valves (TAV). Porcine pericardium (PP) and younger BP have been suggested as candidates TAV leaflet biomaterials for smaller-profile devices due to their reduced thickness; however, their mechanical and structural properties remain to be fully characterized. This study characterized the material properties of chemically treated thick (PPK) and thin (PPN) PP, as well as fetal (FBP), calf (CBP) and adult (ABP) BP tissues in order to better understand their mechanical behavior.

Methods

Planar biaxial testing and uniaxial failure testing methods were employed to quantify tissue mechanical responses and failure properties. Fiber characteristics were examined using histological analysis.

Results

ABP and CBP tissues were significantly stiffer and stronger than the younger FBP tissues. Histological analysis revealed a significantly larger concentration of thin immature collagen fibers in the FBP tissues than in the ABP and CBP tissues. While PP tissues were thinnest, they were stiffer and less extensible than the BP tissues.

Conclusions

Due to comparable mechanical properties but significantly reduced thickness, CBP tissue may be a more suitable material for TAV manufacturing than ABP tissue. FBP tissue, despite its reduced thickness and

¹ These individuals should be considered co-first authors.

Download English Version:

<https://daneshyari.com/en/article/5020499>

Download Persian Version:

<https://daneshyari.com/article/5020499>

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