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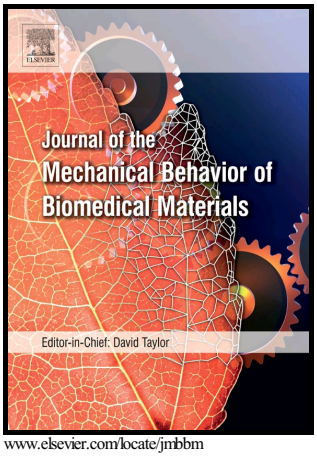

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Ying Lei, Shirin Masjedi, Zannatul Ferdous*

Mechanical, Aerospace, and Biomedical Engineering, University of Tennessee, Knoxville, TN 37996

***Corresponding author.** Zannatul Ferdous, Ph.D., 312 Perkins Hall, University of Tennessee, Knoxville, TN 37996. Tel.: 865.974.6678; fax: 865.974.5274.

zferdous@utk.edu

Abstract

In aortic valves, biaxial cyclic stretch is known to modulate cell differentiation, extracellular matrix (ECM) synthesis and organization. We designed a novel bioreactor that can apply independent and precise stretch along radial and circumferential directions in a tissue culture environment. While this bioreactor can be used for either native or engineered tissues, this study determined matrix remodeling and strain distribution of aortic cusps after culturing under biaxial stretch for 14 days. The contents of collagen and glycosaminoglycans were determined using standard biochemical assays and compared with fresh controls. Strain fields in static cusps were more uniform than those in stretched cusps, which indicated degradation of the ECM fibers. The