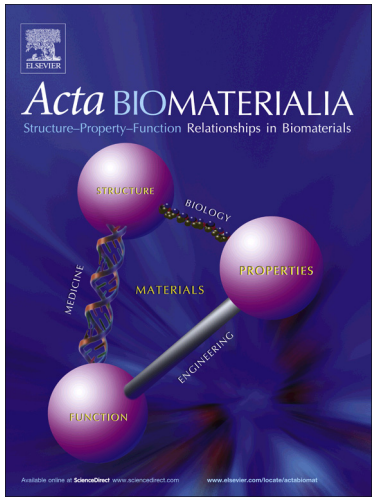

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Pressure-induced Microstructural Changes in Porcine Tricuspid Valve Leaflets

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Abstract

Quantifying mechanically-induced changes in the tricuspid valve extracellular matrix (ECM) structural components, e.g. collagen fiber spread and distribution, is important as it determines the overall macro-scale tissue responses and subsequently its function/malfunction in physiological/pathophysiological states. For example, functional tricuspid regurgitation, a common tricuspid valve disorder, could be caused by elevated right ventricular pressure due to pulmonary hypertension. In such patients, the geometry and the normal function of valve leaflets alter due to chronic pressure overload, which could cause remodeling responses in the ECM and change its structural components. To understand such a relation, we developed an experimental setup and measured alteration of leaflet microstructure in response to pressure increase in porcine tricuspid valves using the small angle light scattering technique. The anisotropy index, a measure of the fiber spread and distribution, was obtained and averaged for each region of the anterior, posterior, and septal leaflet using four averaging methods. The average anisotropy indices (mean±standard error) in the belly region of the anterior, posterior, and septal leaflets of non-pressurized valves were found to be 12±2%, 21 ±3% and 12±1%, respectively. For the

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