

Aortic Valve Leaflet Curvature as a Function of Elastin Degradation

By: **Amanda Barreto*** | Asad M. Mirza | Daniel Chaparro | Ahmed Z. Ali | Rachel Montlavan | Joshua D. Hutcheson | Sharan Ramaswamy

During the cardiac cycle, the heart valves assist in the coordination of blood flow. Heart valve dysfunction leads to a significantly high rate of mortality around the world. Aortic valve calcification (AVC) is caused by defects in the valves and it is a health condition which usually requires surgical valve replacement. The elastin protein within the aortic valve leaflets coordinates leaflet structure and recoil during the opening and closing of the valve. Elastin degradation in the extracellular matrix (ECM) could play a significant function in the progression of AVC. The leaflet curvature is critical to blood flow through the valve and to the rest of the heart. The proposed project aims to capture images of the aortic leaflet curvature while cyclic flexure is conducted. An analysis will be made of the correlation of elastin degradation and curvature that may lead to AVC. To observe the changes in curvature porcine aortic valves will be tested with different degrees of elastin degradation by subjecting them to elastolytic enzyme elastase. The curvature of the leaflets will be captured using two high-frame rate video systems. The aortic valve leaflet flexure experiments will be produced using a Vivitro Pulse Duplicator (Vivitro Labs Inc. Victoria, BC, Canada). The project's hypothesis is that elastin degradation in the leaflets of the valves could eventually lead to aortic valve calcification because of its effects on the leaflets' curvature due to the high presence of elastin fibers throughout the leaflets. Future work includes the quantification of the leaflets' curvature via software and its computation from standard medical images derived from echocardiography, CT or MRI, which could be used as an early indicator of AVC, avoiding surgery for the patient if it is diagnosed at an early stage.