Post-Infarction Left Ventricular Remodeling using the Law of Laplace

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The contractile function of a heart is determined by factors including cavity volume, wall thickness, internal pressure, intrinsic muscle property, and circumferential stress and strain. In this study, we used the Law of Laplace to investigate how left ventricular (LV) geometry and the heart's intrinsic properties impact chamber function during passive inflation. The geometric parameters were identified by means of image analysis of MRI scans of a healthy and failing mouse heart, while the end-diastolic pressure (EDP) and muscle property parameters were identified from literature. Changes in geometric configurations, pressure-volume relationships, and stress-strain relationships were studied across healthy and infarct geometries and three elastic modulus configurations. The results show that LV geometry and the muscle's intrinsic properties independently impact chamber function and together contribute to the changes in cardiac function.