Title: Individualized cardiopulmonary blood flow analysis of mouse

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Abstract:
Individualized modeling and simulation of blood flow mechanics find applications in both animal research and patient care. We provide a coupled circulation model between myocardium mechanics and individualized pulmonary arterial network in physiological normotensive states and pathophysiological hypertensive states from arterial stiffening. In the reduced networks, we observed converged pulmonary arterial pressure profile just with 4 generations of arterial vessels. In addition, pulsatile mechanics of blood flow were simulated to explore the potential impact of the observed heterogeneity on pulmonary vascular mechanics. It is shown that the heterogeneity that is observed primarily at the level of the smaller vessels (radii of approximately 0.25 mm and lower) has little impact on the simulated pressure wave propagation in the larger arteries of the first two or three orders of the arterial tree. Arterial stiffening shows increased wave reflection and impedance, and the consequential right ventricular afterload. This is one step forward for further characterization of hemodynamics on the pulmonary hypertension.