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Comparative study of diastolic filling under varying left ventricular wall stiffness PRITAM MEKALA, ARVIND SANTHANAKRISHNAN, Oklahoma State University — Pathological remodeling of the human cardiac left ventricle (LV) is observed in hypertensive heart failure as a result of pressure overload. Myocardial stiffening occurs in these patients prior to chronic maladaptive changes, resulting in increased LV wall stiffness. The goal of this study was to investigate the change in intraventricular filling fluid dynamics inside a physical model of the LV as a function of wall stiffness. Three LV models of varying wall stiffness were incorporated into an in vitro flow circuit driven by a programmable piston pump. Windkessel elements were used to tune the inflow and systemic pressure in the model with least stiffness to match healthy conditions. Models with stiffer walls were comparatively tested maintaining circuit compliance, resistance and pump amplitude constant. 2D phase-locked PIV measurements along the central plane showed that with increase in wall stiffness, the peak velocity and cardiac output inside the LV decreased. Further, inflow vortex ring propagation toward the LV apex was reduced with increasing stiffness. The above findings indicate the importance of considering LV wall relaxation characteristics in pathological studies of filling fluid dynamics.

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