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Computational Modeling of Blood Flow and Valve Dynamics in Hearts with Hypertrophic Cardiomyopathy XUDONG ZHENG, RAJAT MITTAL, THEODORE ABRAHAM, AURELIO PINHEIRO, The Johns Hopkins University — Hypertrophic Cardiomyopathy (HCM) is a cardiovascular disease manifested by the thickening of the ventricular wall and often leads to a partial obstruction to the blood flow out of the left ventricle. HCM is recognized as one of the most common causes of sudden cardiac death in athletes. In a heart with HCM, the hypertrophy usually narrows the blood flow pathway to the aorta and produces a low pressure zone between the mitral valve and the hypertrophy during systole. This low pressure can suck the mitral valve leaflet back and completely block the blood flow into the aorta. In the current study, a sharp interface immersed boundary method flow solver is employed to study the hemodynamics and valve dynamics inside a heart with HCM. The three-dimensional motion and configuration of the left ventricle including mitral valve leaflets and aortic valves are reconstructed based on echo-cardio data sets. The mechanisms of aortic obstruction associated with HCM are investigated. The long term objective of this study is to develop a computational tool to aid in the assessment and surgical management of HCM.

Xudong Zheng
The Johns Hopkins University

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