Analyzing the Hemodynamics of the Left Ventricle through MRI-Based Complex Fluid Dynamics Models

O'Brien, Daniel

A model of the left ventricle (LV) was derived from MRI scans using the biomedical imaging software Mimics and Maya animation software. Short axis cardiac MRI images (20 phases each with 12 slices) documented the movement of the heart throughout the cardiac cycle. The lumenal margin of the LV, left atrium, and aorta was segmented and a 3D model was derived from the segmentations. This was then smoothened by melding it with a generic LV model. Navier-Stokes computational fluid dynamics equations were used to derive blood flow patterns inside the LV. This novel, noninvasive method of cardiac flow observation could serve as a practical tool in the diagnosis of heart disease.

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