CFD Simulation of Vessel Wall Stress Distributions by Normal and Dissected Aortic Models

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Abstract

In this work, shear stress distributions on three-dimensional realistic health and dissected aortic vessels are simulated by the Computational Fluid Dynamics (CFD) Technique. A health aorta model demonstrates that the maximum wall stress distribution is presented on the aortic arch in the systole. Also, it is observed that an counter-clockwise pair of vortices of a secondary flow appears in the downstream of aortic arch in the late systolic and turn out to be a pair of counter-clockwise vortex in the early diastole. The aortic stenosis model demonstrates that the maximum shear stress is shown to distribute around the stenosis. In addition, it is also shown that a counter-clockwise vortex migrates from the stenotic region to the downstream of stenosis, and then becomes a clockwise vortex in the systole. However, the clockwise single vortex becomes a pair of vortex in the early diastolic.

Keyword：Aortic Dissection, Secondary Flow, Wall Stress