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Blood Flow in the Stenotic Carotid Bifurcation VITALIY RAYZ, STANLEY BERGER, University of California, Berkeley — The carotid artery is prone to atherosclerotic disease and the growth of plaque in the vessel, leading often to severe occlusion or plaque rupture, resulting in emboli and thrombus, and, possibly, stroke. Modeling the flow in stenotic blood vessels can elucidate the influence of the flow on plaque growth and stability. Numerical simulations are carried out to model the complex flows in anatomically realistic, patient-specific geometries constructed from magnetic resonance images. The 3-D unsteady Navier-Stokes equations are solved in a finite-volume formulation, using an iterative pressure-correction algorithm. The flow field computed is highly three-dimensional, with high-speed jets and strong recirculating secondary flows. Sharp spatial and temporal variations of the velocities and shear stresses are observed. The results are in a good agreement with the available experimental and clinical data. The influence of non-Newtonian blood behavior and arterial wall compliance are considered. Transitional and turbulent regimes have been looked at using LES. This work supports the conjecture that numerical simulations can provide a diagnostic tool for assessing plaque stability.

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