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The effect of hemodynamics on the failure of endovascular coiling in cerebral aneurysms KYUNG SE CHA, ELIAS BALARAS, Dept. Mechanical Engineering, University of Maryland, College Park, MD 20742, BARUCH B. LIEBER, Dept. Biomedical Engineering, University of Miami, Coral Gables, FL 33146 — Today the treatment of intracranial aneurysms with endovascular coils is an established procedure which has several advantages compared to surgical clipping. However, coil compaction with recanalization remains a long term problem and is observed in approximately 50% of large and giant aneurysm cases over a 5-6 year follow-up period. Clinical data suggest that the coil packing density and the location and size of the aneurysm are important parameters in the long term outcome, suggesting that the repeated impulses exerted by the impingement of the pulsatile blood flow on the coil are mainly responsible for coil compaction. To test this hypothesis we will present: 1. patient specific simulations of two different clinical cases having high and low coil compaction risk respectively; 2. a systematic study on the effects of various geometrical parameters (bifurcation angle, ratio of aneurysm neck size to parent vessel diameter) on the magnitude of the total force on the coil, using idealized configurations. In all cases the three-dimensional laminar flow computations have been carried out using an unstructured, finite-element, Navier-Stokes solver. It will be shown that the ratio of aneurysm neck size to parent vessel diameter has the largest influence on the maximum force on the coil, which is less sensitive to the bifurcation angle.

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