Numerical Simulations of Blood Flow Dynamics in Cerebral Aneurysms

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Cerebral aneurysms are abnormal focal dilatations of the artery walls, typically present near or at the bifurcations of the circle of Willis. The most serious consequence is their rupture causing subarachnoid hemorrhage with an associated high mortality. Recently, the interest in computational methods to help neurosurgeons to assess the aneurysm rupture risk is constantly growing.

In this work we present computer simulations of blood flow dynamics including fluid–structure interaction in three cerebral aneurysm models using a specific medical software MEDVIS 3D. The aneurysms are located in different brain arteries and their geometries are reconstructed from 3D computed tomography angiography image data. For our simulations we assume Newtonian properties of blood and linear elastic behavior of the vessel/aneurysm wall. We visualize the distributions of the basic hemodynamic characteristics as velocity, pressure and WSS in the aneurysm wall of each aneurysm.