Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Accuracy of Computational Cerebral Aneurysm Hemodynamics Using Patient-Specific Endovascular Measurements[1] PATRICK MCGAH, MICHAEL LEVITT, MICHAEL BARBOUR, PIERRE MOURAD, LOUIS KIM, ALBERTO ALISEDA, University of Washington — We study the hemodynamic conditions in patients with cerebral aneurysms through endovascular measurements and computational fluid dynamics. Ten unruptured cerebral aneurysms were clinically assessed by three dimensional rotational angiography and an endovascular guidewire with dual Doppler ultrasound transducer and piezoresistive pressure sensor at multiple peri-aneurysmal locations. These measurements are used to define boundary conditions for flow simulations at and near the aneurysms. The additional in vivo measurements, which were not prescribed in the simulation, are used to assess the accuracy of the simulated flow velocity and pressure. We also performed simulations with stereotypical literature-derived boundary conditions. Simulated velocities using patient-specific boundary conditions showed good agreement with the guidewire measurements, with no systematic bias and a random scatter of about 25%. Simulated velocities using the literature-derived values showed a systematic over-prediction in velocity by 30% with a random scatter of about 40%. Computational hemodynamics using endovascularly-derived patient-specific boundary conditions have the potential to improve treatment predictions as they provide more accurate and precise results of the aneurysmal hemodynamics.

[1]Supported by an R03 grant from NIH/NINDS

Patrick McGah
University of Washington

Date submitted: 02 Aug 2013 Electronic form version 1.4