Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Flow topology in patient-specific abdominal aortic aneurysms during rest and exercise[1] AMIRHOSSEIN ARZANI, SHAWN SHADDEN, Illinois Institute of Technology — Abdominal aortic aneurysm (AAA) is a permanent, localized widening of the abdominal aorta. Flow in AAA is dominated by recirculation, transitional turbulence and low wall shear stress. Image-based CFD has recently enabled high resolution flow data in patient-specific AAA. This study aims to characterize transport in different AAAs, and understand flow topology changes from rest to exercise, which has been a hypothesized therapy due to potential acute changes in flow. Velocity data in 6 patients with different AAA morphology were obtained using image-based CFD under rest and exercise conditions. Finite-time Lyapunov exponent (FTLE) fields were computed from integration of the velocity data to identify dominant Lagrangian coherent structures. The flow topology was compared between rest and exercise conditions. For all patients, the systolic inflow jet resulted in coherent vortex formation. The evolution of this vortex varied greatly between patients and was a major determinant of transport inside the AAA during diastole. During exercise, previously observed stagnant regions were either replaced with undisturbed flow, regions of uniform high mixing, or persisted relatively unchanged. A mix norm measure provided a quantitative assessment of mixing.

[1]This work was supported by the National Institutes of Health, grant number 5R21HL108272.

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Date submitted: 31 Jul 2012 Electronic form version 1.4