Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Hemodynamic Simulations in Dialysis Access Fistulae[1] PATRICK MCGAH, DANIEL LEOTTA, KIRK BEACH, JAMES RILEY, ALBERTO ALISEDA, University of Washington — Arteriovenous fistulae are created surgically to provide adequate access for dialysis in patients with End-Stage Renal Disease. It has long been hypothesized that the hemodynamic and mechanical forces (such as wall shear stress, wall stretch, or flow- induced wall vibrations) constitute the primary external influence on the remodeling process. Given that nearly 50% of fistulae fail after one year, understanding fistulae hemodynamics is an important step toward improving patency in the clinic. We perform numerical simulations of the flow in patient-specific models of AV fistulae reconstructed from 3D ultrasound scans with physiologically-realistic boundary conditions also obtained from Doppler ultrasound. Comparison of the flow features in different geometries and configurations e.g. end-to-side vs. side-to-side, with the *in vivo* longitudinal outcomes will allow us to hypothesize which flow conditions are conducive to fistulae success or failure. The flow inertia and pulsatility in the simulations (mean $Re \approx 700$, max $Re \approx 2000$, $Wo \approx 4$) give rise to complex secondary flows and coherent vortices, further complicating the spatio- temporal variability of the wall pressure and shear stresses. Even in mature fistulae, the anastomotic regions are subjected to non-physiological shear stresses ($> 10\,Pa$) which may potentially lead to complications.

[1]Supported by an R21 Grant from NIDDK (DK081823)

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Date submitted: 06 Aug 2010

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