Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Fluid-Structure interaction modeling in deformable porous arteries[1] RANA ZAKERZADEH, PAOLO ZUNINO, Univ of Pittsburgh — A computational framework is developed to study the coupling of blood flow in arteries interacting with a poroelastic arterial wall featuring possibly large deformations. Blood is modeled as an incompressible, viscous, Newtonian fluid using the Navier-Stokes equations and the arterial wall consists of a thick material which is modeled as a Biot system that describes the mechanical behavior of a homogeneous and isotropic elastic skeleton, and connecting pores filled with fluid. Discretization via finite element method leads to the system of nonlinear equations and a Newton-Raphson scheme is adopted to solve the resulting nonlinear system through consistent linearization. Moreover, interface conditions are imposed on the discrete level via mortar finite elements or Nitsche's coupling. The discrete linearized coupled FSI system is solved by means of a splitting strategy, which allows solving the Navier-Stokes and Biot equations separately. The numerical results investigate the effects of proroelastic parameters on the pressure wave propagation in arteries, filtration of incompressible fluids through the porous media, and the structure displacement.

[1]The fellowship support from the Computational Modeling & Simulation PhD program at University of Pittsburgh for Rana Zakerzadeh is gratefully acknowledged.

Rana Zakerzadeh
Univ of Pittsburgh

Date submitted: 09 Jul 2015

Electronic form version 1.4