Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Numerical Simulation of Bubble Dynamics in Deformable Vessels[1] VEDRAN CORALIC, TIM COLONIUS, California Institute of Technology — The growth and collapse of cavitation bubbles has been implicated as a potential damage mechanism leading to the rupture of blood vessels in shock wave lithotripsy (SWL). While this phenomenon has been investigated numerically, the resulting simulations have often assumed some degree of symmetry and have often failed to include a large number of influential physics, such as viscosity, compressibility, surface tension, phase change and fluid-structure interactions. We present here our efforts to explore the role that cavitation bubbles play in the rupture of blood vessels in SWL and to improve upon the current state of the numerical approach. We have developed a three- dimensional, high-order accurate, shock- and interface-capturing, multicomponent flow algorithm that accounts for the effects of viscosity and surface tension. At this time, we omit any effects due to elasticity and instead, as a first step, model tissue as a viscous and stiffened gas. We discuss preliminary results for the Rayleigh and shock-induced collapse of a gas bubble within a blood vessel and characterize the increase in vessel deformation with increasing bubble confinement and proximity to the vessel wall.

[1]This research was supported by the National Institutes of Health grant No. 2PO1DK43881.

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Date submitted: 04 Aug 2011 Electronic form version 1.4