Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Bubble Transport in Multiple Arteriole Bifurcations – Experimental Modeling BRIJESH ESHPUNIYANI, J. FOWLKES, JOSEPH BULL, The University of Michigan — A bench top vascular bifurcation model is used to investigate the splitting of long bubbles in a series of liquid-filled bifurcations. This study is motivated by a novel gas embolotherapy technique which aims to treat cancer by infarcting tumors with gas emboli that are formed by selective acoustic vaporization of ∼6-micrometer, intravascular, perfluorcarbon (PFC) droplets. The resulting gas bubbles are several times larger in volume than the initial PFC droplets, and can extend through several vessel bifurcations. The current bench top experiments examine the effects of gravity and flow on bubble transport through multiple bifurcations. The effect of gravity is varied by changing the roll angle of the bifurcating network about its parent tube. Splitting at each bifurcation is nearly even when the roll angle is zero. At non-zero roll angles, higher flow rates lead to increased homogeneity in splitting. We also find that bubbles can either stick at one of the second bifurcations or in the second generation daughter tubes, even though the flow rate in the parent tube is constant. The findings of this work indicate that both gravity and flow are important in determining the bubble transport, and suggest that a treatment strategy that includes multiple doses may be effective in delivering emboli to vessels not occluded by the initial dose. This work is supported by NSF grant BES-0301278 and NIH grant EB003541.

Joseph Bull
The University of Michigan

Date submitted: 03 Aug 2005 Electronic form version 1.4