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Transport of cardiovascular microbubbles in gas embolotherapy JOSEPH L. BULL, ANDRES J. CALDERON, BRIJESH ESHPUNIYANI, DOUG VALASSIS, J. BRIAN FOWLKES, The University of Michigan — This work is motivated by our ongoing development of a novel gas embolotherapy technique to occlude blood flow to tumors using gas bubbles that are selectively formed by the in vivo acoustic vaporization of liquid perfluorocarbon droplets. The droplets are small enough to pass through the microcirculation, but the subsequent bubbles are large enough to lodge in vessels. The uniformity of tumor infarction depends on the transport the blood-borne bubbles before they stick. We theoretically and experimentally investigate the transport of gas bubbles through bifurcating blood vessels. More homogenous bubble splitting is observed for higher values of capillary numbers and lower values of Bond numbers. The dependence of bubble lodging on flow parameters is also investigated, and several modes of bubble lodging and sticking are identified. These findings indicate the ability of gas bubbles to occlude flow and suggest the potential for development of treatment strategies that uniformly occlude the tumor circulation while minimizing collateral infarction. This work is supported by NSF grant BES-0301278 and NIH grant EB003541.

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