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Bubble sticking and sliding along the wall of a two-dimensional bifurcating channel JOSEPH BULL, BRIJESH ESHPUNIYANI, The University of Michigan — A two-dimensional bifurcating channel flow in which a bubble initially adheres to one of the walls is studied computationally. This investigation is motivated by a developmental gas embolotherapy technique to occlude blood flow to a tumor and induce necrosis. The bubbles originate as perfluorocarbon droplets that are small enough to pass through capillaries. The droplets are vaporized at the desired location using high intensity ultrasound to produce much larger gas bubbles that can then stick to occlude vessels. One possible scenario is that a bubble contacts the vessel wall and then slides along or sticks to the wall. Since the Reynolds numbers in the microcirculation are small, we use the boundary element method. A Tanner law is used to model the moving contact line dynamics. The evolution of the bubble interface, pressure and velocity fields, and wall normal and shear stresses are examined for a range of inlet to outlet pressure ratios. Preliminary results suggest that the bubble can slide, stick, or detach, depending on the flow parameters. We also observe that the horizontal force acting on the bubble approaches a constant value as the simulation progresses in time. The evolution of bubble interface and it effect on the flow rate through the channel depend significantly on whether the vessel wall is hydrophilic or hydrophobic. This work is supported by NSF grant BES-0301278 and NIH grant EB003541.

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