Abstract Submitted
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Soluble surfactants favorably modify fluid structure and wall shear stress profiles during near-occluding bubble motion in a computational model of intravascular gas embolism[1] T.N. SWAMINATHAN, P.S. AYYASWAMY, D.M. ECKMANN, University of Pennsylvania — Finite sized gas bubble motion in a blood vessel causes temporal and spatial gradients of shear stress at the endothelial cell surface lining the vessel wall as the bubble approaches the cell, moves over it and passes it by. Rapid reversals occur in the sign of the shear stress imparted to the cell surface during this motion. The sign-reversing shear is a potently coupled source of cell surface mechanical stretch, potentiating cell injury. The presence of a suitable soluble surfactant in the bulk medium considerably reduces the level of the shear stress gradients imparted to the cell surface as compared to an equivalent surfactant-free system. The bubble shape and the film thickness between the bubble and the vessel wall are also different. Furthermore, the bubble residence time near the proximity of a cell surface changes in comparison. These results based on our modeling may help explain several phenomena observed in experimental studies related to gas embolism, a significant problem in cardiac surgery and decompression sickness.

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