Abstract Submitted
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Fluid-Structure Model of Lymphatic Valve and Vessel[1] KI WOLF, MATTHEW BALLARD, ZHANNA NEPIYUSHCHIKH, MOHAMMAD RAZAVI, BRANDON DIXON, ALEXANDER ALEXEEV, Georgia Inst of Tech — The lymphatic system is a part of the circulatory system that performs a range of important functions such as transportation of interstitial fluid, fatty acid, and immune cells. The lymphatic vessels are composed of contractile walls to pump lymph against adverse pressure gradient and lymphatic valves that prevent back flow. Despite the importance of lymphatic system, the contribution of mechanical and geometric changes of lymphatic valves and vessels in pathologies of lymphatic dysfunction, such as lymphedema, is not well understood. We developed a coupled fluid-solid computational model to simultaneously simulate a lymphatic vessel, valve, and flow. A lattice Boltzmann model is used to represent the fluid component, while lattice spring model is used for the solid component of the lymphatic vessel, whose mechanical properties are derived experimentally. Behaviors such as lymph flow pattern and lymphatic valve performance against backflow and adverse pressure gradient under varied parameters of lymphatic valve and vessel geometry and mechanical properties are investigated to provide a better insight into the dynamics of lymphatic vessels, valves, and system and give insight into how they might fail in disease.

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