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Modeling fluid transport in a contracting lymphatic vessel[1] KI WOLF, J. BRANDON DIXON, ALEXANDER ALEXEEV, Georgia Inst of Tech — The lymphatic system plays a crucial role for the body by transporting interstitial fluid, fatty acid, and immune cells. This is achieved through networks of valved contracting vessels called lymphangions that circulate fluid without central pump and against adverse condition. Despite a large medical importance to understand this process, research on lymphatic pumping has been limited, especially on lymphatic valves. In this work, we develop a fully coupled 3D fluid-structure interaction model to investigate how different valve and vessel properties such as contraction frequency, contraction amplitude, and valve elastic properties affect the pumping against an adverse pressure gradient. Our results suggest that the valve's ability to effectively reduce backflow under different flow conditions is the determining factor in overall pumping performance of lymphatic system. We show that lymphatic valves increase net flow when compared with vessels without valves at the cost of increased viscous losses. Furthermore, at certain conditions valves can diminish the pumping performance, suggesting potential implications to lymphatic pathologies.

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