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Vortex Rings in Stenotic Arterial Models

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Atherosclerosis, a disease of the vasculature characterized by plaque formation in arteries, is of the leading causes of death in the western world. The global aim of the current work is to directly link fluid mechanical stimuli to cellular response in physiologically relevant geometries. This paper focuses on the vortex ring formation observed downstream of an occlusion in a tube subjected to a sinusoidal forcing function. Particle Image Velocimetry was used to measure the velocity fields at the tube centerline between 1.2 and 2.9 tube diameters downstream of the occlusion. It was found that the shear layer in the recirculating region reduces the circulation of the vortex ring as it progresses downstream within the tube. Future work will involve a more detailed investigation of the vortex ring formation and breakdown, and implications of these phenomena on cellular mechanotransduction.

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