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The effect of waveform shape on the flow in endovascular stents AMIRREZA ROUHI, MATTHEW FORD, UGO PIOMELLI, Queen's University, PAVLOS VLACHOS, VPISU — We studied the effects of the imposed waveform on the flow in an idealized stented artery. Two stents were used in this study, both based on commercially available geometries. The Navier-Stokes equations were solved using a cartesian staggered code, and the stents were modelled via an immersed-boundary method. The Reynolds number and Womersley number are 160 and 2.09 respectively. The presence of flow reversal results in the formation of vortices between the stent struts, which detach from the wall and migrate toward the center of the channel. Truncated series representations of the waveform shape were tested to determine the effect of the waveform detail on the flow dynamics. A reduction in the number of Fourier modes did not affect the time-averaged wall shear stress or the distribution of the Oscillatory Shear Index. The formation of vortical structures and their kinematics were insensitive to the geometrical detail. We examined cases with decreased percentages of flow reversal, achieved by increasing the mean flow rate while maintaing the waveform shape. We initially observed two vortex formations and liftoffs per cycle. As the duration of flow reversal was decreased, the vortex creation and migration occurred once with the vortex remaining suspended above the stent wires before disappearing. When the flow was unidirectional, no vortex creation was observed.

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