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Investigation of Unsteady Secondary Flow Structures in a Curved Tube using MRI Velocimetry SEAN PETERSON, Polytechnic University, CHEKEMA PRINCE, Polytechnic University, NYU Medical Center, VINAY PAI, NYU Medical Center, JOSHLY VARGHESE, MICHAEL PLESNIAK, Polytechnic University — Under certain conditions, pulsatile flow in a curved tube can exhibit secondary flow patterns which are remarkably different from the steady flow Dean's vortices at an equivalent mean Reynolds number. For instance at sufficiently high Womersley number ($\sim$15), viscous effects are limited to thin Stokes' layers, in which counter-rotating vortical structures are established. These structures induce a counter-rotating vortex pair within the core of the tube with a sense of rotation opposite to that of the steady flow Dean's vortices. In the present study, the axial and secondary flow development in a curved tube subjected to harmonic (sinusoidal) and physiologically-inspired pulsatile waveforms (representative of the cardiovascular circulation in the carotid artery) are investigated using Magnetic Resonance Imaging velocimetry over a range of Reynolds and Womersley numbers. The results are compared to measurements by more traditional experimental techniques such as PIV and LDV. The implications of disturbances introduced into the Stokes' layer, e.g. the structural members of stents, on the global secondary flow structure are discussed.

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