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Secondary flow structures in a 180° elastic curved vessel with torsion under steady and pulsatile inflow conditions[1] MOHAMMAD REZA NAJJARI, MICHAEL W. PLESNIAK, George Washington University — Secondary flow vortical structures were investigated in an elastic 180° curved pipe with and without torsion under steady and pulsatile flow using particle image velocimetry (PIV). The elastic thin-walled curved pipes were constructed using Sylgard 184, and inserted into a bath of refractive index matched fluid to perform PIV. A vortex identification method was employed to identify various vortical structures in the flow. The secondary flow structures in the planar compliant model with dilatation of 0.61%-3.23% under pulsatile flow rate were compared with the rigid vessel model results, and it was found that local vessel compliance has a negligible effect on secondary flow morphology. The secondary flow structures were found to be more sensitive to out of plane curvature (torsion) than to vessel compliance. Torsion distorts the symmetry of secondary flow and results in more complex vortical structures in both steady and pulsatile flows. In high Re number steady flow with torsion, a single dominant vortical structure can be detected at the middle of the 90° cross section. In pulsatile flow with torsion, the split-Dean and Lyne-type vortices with same rotation direction originating from opposite sides of the cross section tend to merge together.

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