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Blockage effects on steady and pulsatile flows in stenotic geometries MARTIN GRIFFITH, IRPHE, France/ FLAIR Monash University, Australia, THOMAS LEWEKE, IRPHE, France, MARK THOMPSON, KERRY HOURIGAN, FLAIR Monash University, Australia — Steady and pulsatile flows through a locally constricted circular tube are studied numerically and experimentally. The geometry, a simplified model of an arterial stenosis, consists of a long straight tube with an axi-symmetric constriction, the size of which is varied. The Reynolds number is varied between 50 and 1400 and the blockage ratio by area between 0.2 and 0.95. For pulsatile flow – a steady Poiseuille flow with an added sinusoidal pulsation – a single frequency is examined, corresponding to a Womersley number of 14. The amplitude of the pulsation is varied between 0 and 1.5. For steady flow, stability analysis of our numerical results reveals a boundary for absolute linear stability, with the mode numbers and structures varying across the blockage range. However, experimental results reveal that strong convective shear layer instabilities occur at much lower Reynolds numbers. For pulsatile flow, experiments again indicate that shear layer instability seems to be of the most importance. However, flows of waveforms of large amplitude, or those possessing a negative velocity component during the pulse cycle, show a period-doubling phenomenon, with successive vortex rings tilting and breaking-up in opposite directions.

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