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A Mathematical Model of Pulsatile Blood Flow through a Bifurcated Artery

Authors : D. Srinivasacharya, G. Madhava Rao

Abstract : In this article, the pulsatile flow of blood flow in bifurcated artery with mild stenosis is investigated. Blood is treated to be a micropolar fluid with constant density. The arteries forming bifurcation are assumed to be symmetric about its axes and straight cylinders of restricted length. As the geometry of the stenosed bifurcated artery is irregular, it is changed to regular geometry utilizing the appropriate transformations. The numerical solutions, using the finite difference method, are computed for the flow rate, the shear stress, and the impedance. The influence of time, coupling number, half of the bifurcated angle and Womersley number on shear stress, flow rate and impedance (resistance to the flow) on both sides of the flow divider is shown graphically. It has been observed that the shear stress and flow rate are increasing with increase in the values of Womersley number and bifurcation angle on both sides of the apex. The shear stress is increasing along the inner wall and decreasing along the outer wall of the daughter artery with an increase in the value of coupling number. Further, it has been noticed that the shear stress, flow rate, and impedance are perturbed largely near to the apex in the parent artery due to the presence of backflow near the apex.

Keywords : micropolar fluid, bifurcated artery, stenosis, back flow, secondary flow, pulsatile flow, Womersley number
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