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Effect of wall elasticity on the flow field through stenosis arteries and veins

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This paper is concerned with a numerical study of laminar pulsatile blood flow in elastic and rigid tapered arteries with tapering angles of (0,0.1, and 0.2) degrees and having stenosis of (0%, 30%, 40% and 50%) in the arterial lumen. Newtonian and non- Newtonian blood models flow through elastic artery, in addition to Newtonian blood model flow through rigid artery were considered in this study. The non-Newtonian behavior of blood was described by using cross mode for the shear thinning behavior of the blood. The flow dynamic analysis applies two-dimensional incompressible flow with Reynolds and Womersley numbers of 200 and 1.54 respectively. Navier-stokes equations were written in form of vorticity-stream function and solved by a finite difference technique with necessary initial and boundary conditions in concert with the biophysical point of view using FORTRAN 90 program. The comparisons between the results considering rigid and elastic arteries showed a decrease in wall shear stress and reduce in pressure drop and less extended separation regions for the elastic artery. The deformation of the arterial wall cannot be neglected while dealing with blood flow studies. The comparison results for the non-Newtonian and the Newtonian fluid flows showed that, the non-Newtonian effects weakness in distortion of flow pattern, pressure drop distribution and wall shear stress. Also, the numerical results were compared with previous researches results.

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