A Numerical Study of Pulsatile Blood Flow in an Eccentric Catheterized Artery Using a Fast Algorithm

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The pulsatile blood flow in an eccentric catheterized artery is studied numerically by making use of an extended version of the fast algorithm of Borges and Daripa [Jour. Comput. Phys., 2001]. The mathematical model involves the usual assumptions that the arterial segment is straight, the arterial wall is rigid and impermeable, blood is an incompressible Newtonian fluid, and the flow is fully developed. The flow rate (flux) is considered as a periodic function of time (prescribed). The axial pressure gradient and velocity distribution in the eccentric catheterized artery are obtained as solutions of the problem. Through the computed results on axial pressure gradient, the increases in mean pressure gradient and frictional resistance in the artery due to catheterization are estimated. These estimates can be used to correct the error involved in the measured pressure gradients using catheters.

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