

Numerical Simulation of Magnetohydrodynamic (MHD) Blood Flow in a Stenosed Artery

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Abstract : Unsteady blood flow has been numerically investigated through stenosed arteries to achieve an idea about the physiological blood flow pattern in diseased arteries. The blood is treated as Newtonian fluid and the arterial wall is considered to be rigid having deposition of plaque in its lumen. For direct numerical simulation, vorticity-stream function formulation has been adopted to solve the problem using implicit finite difference method by developing well known Peaceman-Rachford Alternating Direction Implicit (ADI) scheme. The effects of magnetic parameter and Reynolds number on velocity and wall shear stress are being studied and presented quantitatively over the entire arterial segment. The streamlines have been plotted to understand the flow pattern in the stenosed artery, which has significant alterations in the downstream of the stenosis in the presence of magnetic field. The results show that there are nominal changes in the flow pattern when magnetic field strength is enhanced upto 8T which can have remarkable usage to MRI machines.

Keywords : magnetohydrodynamics, blood flow, stenosis, energy dissipation

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