ABSTRACT

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SMOOTHED PARTICLE HYDRODYNAMICS MODELING OF BLOOD FLOW IN PULSATING ATHEROSCLEROTIC BLOOD VESSEL

(xv + 90 pages: 71 figures; 2 tables; 1 appendix)

In this thesis, blood flow in pulsating atherosclerotic blood vessel is simulated numerically using the smoothed particle hydrodynamics method. The smoothed particle hydrodynamics method is a meshfree particle method to numerically simulate fluid flows.

We improve the boundary model of arterial wall deformation together with the inlet and outlet boundary conditions to form a two-dimensional model of a stenosed pulsating artery. We also apply the concept of smoothed particle hydrodynamics to create a non-penetrating condition at the arterial wall as well as maintaining a stable flow in the interior.

We run the simulation with 7600 fluid particles and 1602 boundary particles. The results show that the flow in a pulsating artery is pulsatile, and the pressures of the particles at the narrowed part are higher than the nonpulsating stenosed artery case.

Keywords: smoothed particle hydrodynamics, atherosclerosis, blood flow, pulsating.