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Unsteady flows modeling using Smoothed Particle Hydrodynamics SHAHROKH SHAHRIARI, IBRAHIM HASSAN, LYES KADEM, Mechanical and Industrial Engineering Department, Concordia University, Montreal, Canada — Cardiovascular diseases are the major cause of death in North America. Investigation of blood flow behavior in the cardiovascular system is, therefore, of great interest in biomedical engineering and cardiology. These kinds of flows are characterized by highly inertial pulsatile effects and deformable boundaries. The most important limitation of conventional numerical methods for simulating such flows is their main nature dependence on the process of mesh generation; distortion and remeshing that are numerically expensive. An alternative to overcome these limitations can be the new generation of numerical methods called meshfree methods. Smoothed Particle Hydrodynamics (SPH) is a Lagrangian meshfree method created originally to simulate astrophysical phenomena and later developed for applications in continuum solid and fluid mechanics. In this investigation, the potential of SPH method to model pulsating laminar flow in simplified (rigid) geometries found in the cardiovascular system such as left heart cavity and stenosed artery are examined. This work represents the first attempt to model internal pulsatile flows for a variety of Reynolds numbers using SPH. Although reaching physiological conditions still needs several improvements, SPH showed a good capability and could become a promising numerical method to simulate cardiovascular flows.

Shahrokh Shahriari
Mechanical and Industrial Engineering Department,
Concordia University, Montreal, Canada

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