11th World Congress on Computational Mechanics (WCCM XI)
5th European Conference on Computational Mechanics (ECCM V)
6th European Conference on Computational Fluid Dynamics (ECFD VI)
July 20–25, 2014, Barcelona, Spain

PREDICTION OF PULSATILE 3D FLOW IN ELASTIC TUBES USING STAR CCM+ CODE

D.P. de Andrade*, J.M.C. Pereira AND J.C.F. Pereira

*Instituto Superior Técnico / Universidade de Lisboa, Mech. Eng. Depart. LASEF
Av. Rovisco Pais 1, 1049-001 Lisbon, Portugal
e-mail: didier.philippe.andrade@tecnico.ulisboa.pt

Key words: *Pulsatile flow, Curved pipe, Dean flow, Lyne flow, Secondary flow, Collapsible tube flow, Fluid-structure interaction (FSI), Finite Volume Method.*

Three-dimensional fluid-structure interaction is studied numerically in several elastic straight or curved pipes under a pulsatile flow. The finite volume code STAR-CCM+ is used to solve the fluid-structure interaction problem governed by the Navier Stokes equations with the large displacement model in a stongly coupled interaction. Two cases are considered for the validation purposes: straight collapsible tube with different thicknesses, for validation of the fluid-structure model and pulsatille flow in a rigid curved pipe. Finally, the comparison between rigid and elastic walls on the pulsatile flow in a curved pipe is performed for several Young modulus and Womersley numbers. The results show a detailed validation of the STAR-CCM+ code for the fluid-structure interaction model problem and a physical sound result considering the influence of the wall elasticity on the Dean vortices of the secondary flow.

REFERENCES

[1] Marzo, A.,Luo X.Y.,Bertram C.D.,*Three-dimensional collapse and steady flow in thick-walled flexible tubes*, *Journal of Fluids and Structures* (2005) **20**:817-835.

[2] Janela J., Moura A., Sequeira A., *A 3D non-Newtonian fluid-structure interaction model for blood flow in arteries*, *Journal of Computational and Applied Mathematics* (2010) **234**:2783-2791.