Investigation the Effect of Velocity Inlet and Carrying Fluid on the Flow inside Coronary Artery

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Abstract : In this study OpenFOAM 4.4.2 was used to investigate flow inside the coronary artery of the heart. This step is the first step of our future project, which is to include conjugate heat transfer of the heart with three main coronary arteries. Three different velocities were used as inlet boundary conditions to see the effect of velocity increase on velocity, pressure, and wall shear of the coronary artery. Also, three different fluids, namely the University of Wisconsin solution, gelatin, and blood was used to investigate the effect of different fluids on flow inside the coronary artery. A code based on Reynolds Stress Navier Stokes (RANS) equations was written and implemented with the real boundary condition that was calculated based on MRI images. In order to improve the accuracy of the current numerical scheme, hex dominant mesh is utilized. When the inlet velocity increases to 0.5 m/s, velocity, wall shear stress, and pressure increase at the narrower parts.

Keywords : CFD, simulation, OpenFOAM, heart