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Computational Study of Blood Flow Analysis for Coronary Artery Disease

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Abstract : The aim of this study is to estimate the effect of blood flow through the coronary artery in human heart so as to assess the coronary artery disease.Velocity, wall shear stress (WSS), strain rate and wall pressure distribution are some of the important hemodynamic parameters that are non-invasively assessed with computational fluid dynamics (CFD). These parameters are used to identify the mechanical factors responsible for the plaque progression and/or rupture in left coronary arteries (LCA) in coronary arteries.The initial step for CFD simulations was the construction of a geometrical model of the LCA. Patient specific artery model is constructed using computed tomography (CT) scan data with the help of MIMICS Research 19.0. For CFD analysis ANSYS FLUENT-14.5 is used.Hemodynamic parameters were quantified and flow patterns were visualized both in the absence and presence of coronary plaques. The wall pressure continuously decreased towards distal segments and showed pressure drops in stenotic segments. Areas of high WSS and high flow velocities were found adjacent to plaques deposition.

Keywords : angiography, computational fluid dynamics (CFD), time-average wall shear stress (TAWSS), wall pressure, wall shear stress (WSS)
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