COMPUTATIONAL FLUID DYNAMICS OF STENOTIC BLOOD VESSEL

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"I declared that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree"

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ABSTRACT

Knowledge of fluid mechanics very important because blood is the fluid in blood vessel that we want to study. In this case, computational fluid dynamic software (CFD) can help analyze and simulate the fluid flow in blood vessel. Hemodynamic factors and biomechanical forces play key roles in atherogenesis, plaque development and final rupture. In this paper, we investigated the flow field and stress field for different degrees of stenoses under physiological conditions. Disease is modelled as axisymmetric cosine shape stenoses with varying diameter reductions of 30%, 40%, 50%, 60% and 70%, respectively. The obtained pressure drop increases in potential form with the inlet velocity for a fixed stenosis severity. The results show that the maxima velocity and WSS at throat increase in exponential form with stenosis severity. A simulation model which incorporates fluid–structure interaction, a turbulence model and realistic boundary conditions has been developed. The results from this investigation suggest that severe stenoses inhibit wall motion, resulting in higher blood velocities and higher peak wall shear stress. These factors may contribute to further development and rupture of plaques.

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