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Numerical investigation of wall elasticity effects on blood flow and low density lipoprotein mass transfer in carotid bifurcation

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In modern countries cardiovascular diseases are one of the most prevalent death reasons, among which atherosclerosis is the most common one. Depending on atherosclerosis plaque formation locations, Temporary Ischemic Attack (TIA) and heart or brain stroke may occur. It seems wall motion plays a major role in alteration of flow and Low Density Lipoprotein (LDL) accumulation. The purpose of the current study is to investigate the wall elasticity effects on flow and LDL mass transfer inside the carotid bifurcation. So the carotid bifurcation artery modeled as solid, linear elastic and Rubber-Like material (Mooney-Rivlin). The blood is modeled as Carreau fluid and a pulsatile flow applied as Common Carotid Artery (CCA) inlet. Also Fluid Structure Interaction (FSI) transient analysis is performed. The wall elasticity effects on the flow are presented in three-time steps; early systole, end systole and end diastole. Results show that linear elastic and rubber-like models, predict very similar blood flow fields however wall behavior is different in each model. Results show for large arteries like carotid bifurcation, solid wall model is not adequate, Rubber-Like model (Mooney-Rivlin) are the best arterial wall model and linear wall elastic model is in second place.

Biography

Majid Ghassemi is a Professor of Mechanical Engineering Department at the K. N. Toosi University of Technology; one of the most prestige's technical university in Tehran, Iran. He is currently a Visiting Professor at the Centre for Hydrogen and Fuel Cell Research at the University of Birmingham. He teaches graduate and under graduate courses and conduct research in the area of heat transfer and its application in drug delivery, fuel cell and alternative energy. He has over 20 years of academic and industrial experience and served as the President of the K. N. Toosi University of Technology from 2010 through 2013. He has also served in several public and private boards and panels and supervised several undergraduate, masters and PhD students published several books and many journal and conference papers. He is currently an Editor-in-Chief of the *International Journal of Prevention and Treatment* and Managing Editor of the *American Journal of Mechanical Engineering (AJME)* as well as Editorial Board Member for many international journals. He received his PhD in Mechanical Engineering from Iowa State University in 1993.

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