

Abstract

Khalid M Saqr

Effects of Non-Newtonian Viscosity on the Hemodynamics of Cerebral Aneurysms

Blood hemodynamics studies is becoming a significant tool for facilitating diagnosis and rupture risk assessment of cerebral aneurysms. The purpose of this study is to present a comparative study between Newtonian and non-Newtonian blood viscosity models for simulating the hemodynamic wall shear stress (WSS) of cerebral aneurysms. The non-Newtonian blood viscosity was modeled using the Carreau-Yasuda nonlinear model. Two realistic cerebral aneurysm models, derived from 3D angiography imaging, were studied and simulated via computational fluid dynamics solver based on finite volume method, with a pulsating sinusoidal waveform boundary conditions. The maximum wall shear stresses were found at the aneurysm's neck and apex, the inlet arteriole recorded an average wall shear stress and as for the blebs and tips the wall shear stress values were remarkably low. The comparison showed that non-Newtonian blood viscosity model showed a lower range of WSS than of the Newtonian model, which provides more accuracy for predicting aneurysm rupture.