ABSTRACT
Thoracic Aorta and its three branches at the aortic arch are the inceptive zones of the aortic dissection and atherosclerosis. Due to the complicate aortic flow nature, the geneses of these highly fatal diseases are the abnormal pressures and shear stresses acting upon the vascular intima. Hence, it is important to determine the distributions of wall shear stress and pressure to predict these aortic disorders. In this study, the Phase-Contrast Magnetic Resonance Imaging (PC-MRI) method was used to obtain the true geometry of a normal human thoracic aorta which can be converted into transparent thoracic aorta model by the rapid prototyping (RP) technique. The thoracic aorta model is then used in the in-vitro experiment and numerical computations. Numerical calculations were performed using the computational fluid dynamic (CFD) software ACE+R to determine the flow characteristics of the three-dimensional, steady, incompressible and Newtonian fluid in the thoracic aorta model. The boundary conditions at the inlet and the outlet of the aortic flow were specified from the measured data in the in-vitro experiment. The predictions were in reasonable agreement with the PC-MRI measured velocity profiles in the sagittal plane of the thoracic aorta model. The computed results suggest the preferential development of the early aortic dissection and atherosclerosis being in the areas of either maxima or minima of wall shear stress and pressure.


[17]. 丁大為, 吳秉勳。植入枝架造成血管內壁呈皺摺狀變形後之血液動力及非牛頓流體效應分析。第十一屆全國計算流體力學學術研討會。中華民國九十三年八月。

[18]. 丁大為, 林柏宏。於人體生理條件下左冠狀動脈之幾何形狀變化對其壁面剪應力分布之影響。行政院國家科學委員會專題研究計畫成果報告書。

[19]. 湯同達, 邱英世。動脈位置轉換手術後對動脈流場特性與動脈狹窄之相關研究。行政院國家科學委員會專題研究計畫成果報告書。

[20]. 劉通敏, 丁大為, 陳禹銘。顱內彎形母管與其上側向動脈瘤之脈動流場特性數值模擬。第十一屆全國計算流體力學學術研討會。中華民國九十三年八月。

[21]. 牛仰堯, 伍邦銓, 虞希禹, 曾文毅, 彭旭霞, 李隆政, 鄭守成。人體主動脈之磁振造影良策與數值模擬。第十一屆全國計算流體力學學術研討會。中華民國九十三年八月。

[22]. 李明龍, 周朝宜, 李隆政, 沈澄宇, 施仁傑, 林錫慶。冠狀動脈繞道血管之三維數值模擬。第十一屆全國計算流體力學學術研討會。中華民國九十三年八月。


