APCOM & ISCM
11-14th December, 2013, Singapore

A computational study on cerebral hemodynamic changes associated with carotid arterial surgery

***F.Y. Liang[1], M. Oshima[2], and S. Takagi[2]**

[1] SJTU-CU International Cooperative Research Center, School of Naval Architecture, Ocean and Civil Engineering, Shanghai Jiao Tong University, Shanghai, China.
[2] Department of Mechanical Engineering, The University of Tokyo, Tokyo, Japan

*Corresponding author: fuyouliang@sjtu.edu.cn

A patient-specific hemodynamic modeling method was developed by integrating hemodynamic models with clinical data. The method was applied to study cerebral arterial hemodynamics in a patient undergoing left carotid arterial surgery. Obtained results demonstrated the significant impact of the surgery on cerebral hemodynamics in terms of both flow distribution in the cerebral arterial network and hemodynamic characteristics in local regions. The maximum wall shear stress at the left middle cerebral artery (MCA) bifurcation was found to increase by more than three times after the surgery. The finding may partly explain why the patient suffered from intracranial hemorrhage in the left MCA territory soon after the operation. The present study suggests that patient-specific hemodynamic simulation may provide a potential way to predict the hemodynamic effects of an arterial surgery or evaluate hemodynamic conditions in regions where a detailed hemodynamic measurement is not applicable.

Keywords: Patient-specific hemodynamic modeling, Clinical data, Carotid arterial surgery, Cerebral arterial hemodynamics