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# ANEURYSM BIOMECHANICS: AUTOMATIC ISOLATION OF CEREBRAL ANEURYSMS MESHES FROM PATIENT-SPECIFIC GEOMETRICAL MODELS OF THE FULL BLOOD VESSEL TREE

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**Abstract.** The study and modeling of soft tissue biomechanics has received special attention in the last decades, given its importance in relation to human health and the theoretical complexity of biological materials. In particular, characterization of intracranial aneurysms biomechanics is of key importance in the understanding and prevention of stroke and particularly of subarachnoid hemorrhage, a non negligible cause of disability or death in adults.

It is believed that the aneurysm neck and its surroundings are very sensitive to applied loads, which could be linked to structural instabilities related to the intraoperative rupture risk during the occlusion intervention. For a better understanding of this issue it is needed to perform simulations on a database of patient-specific aneurysm models, which requires high quality surface meshes of the aneurysm dome and its surroundings. Nevertheless, mesh processing represents a challenging task, given the diverse complexity of these geometries, the high amount of time required for the manual procedure and the high dependency on the operator. To tackle these issues, we developed a C++ tool based on the VTK (Visualization Toolkit) library to perform the isolation of aneurysms from the blood vessel tree in a semi automated manner, as part of a pipeline to construct polygonal meshes describing the 3D structure of brain aneurysms. In this work we show the results of its usage on the models of the open database AneuriskWeb (http://ecm2.mathcs.emory.edu/aneuriskweb) for their use in thin shells analysis under the Kirchhoff-Love theory. Additionally, we demonstrate the application of the isolated models in the simulation of the effect of localized loads in the neighboring areas of the aneurysm neck, considering thickness and Young modulus variations between the artery and the dome as well as variations of these parameters in the dome wall.