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INTRACRANIAL ANEURYSMS: CONNECTING HEMODYNAMICS, BIOMECHANICS AND WALL CHARACTERISTICS

Juan R. Cebral*, and Anne M. Robertson †
*Bioengineering Department, Department of Mechanical Engineering, George Mason University, Fairfax, Virginia, jcebral@gmu.edu,
† Department of Mechanical Engineering and Material Sciences, Department of Bioengineering, University of Pittsburgh, Pittsburgh, Pennsylvania, rbertson@pitt.edu

MINI-SYMPOSIUM PROPOSAL

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1 BACKGROUND

Increased detection of incidental unruptured intracranial aneurysms has made the clinical decision making process and management of patients with this disease more challenging since the risk of complications of surgical and endovascular interventions can easily exceed the aneurysms' natural risk of rupture. On the other hand, because aneurysm rupture and subsequent subarachnoid hemorrhage have disastrous consequences it is common to consider preventive treatment. A better strategy would be to treat only those aneurysms that are at high risk of rupture and avoid unnecessary interventions for low risk aneurysms that could safely be followed non-invasively. However, this strategy requires adequate discrimination between high and low risk aneurysms, which has been one of the main focus of aneurysm research for several decades.

2 MOTIVATION

Recent years have seen a large increase in research in the field of cerebral aneurysms using computational models [1]. These studies have mainly focused on understanding the hemodynamic and biomechanical environment of aneurysms and identifying conditions favorable for aneurysm progression and rupture. In parallel, clinical studies have centered on identifying demographic, behavioral, patient and anatomical characteristics associated with aneurysm growth and rupture [2]. However, the detailed mechanisms governing the evolution of intracranial aneurysms remains poorly understood. One reason for this lack of knowledge is the scarce number of studies focusing on tissue properties and their relationships to the hemodynamic and biomechanical environments [3].

3 FOCUS OF THE MINI-SYMPOSYUM

The purpose of this mini-symposium is to bring together cerebral aneurysm researchers with expertise in clinical management of aneurysms, neurosurgery, vascular biology, computational modeling, vascular imaging, and biomechanics, focusing on the interaction between the flow and biomechanical environment of intracranial aneurysms and structural, mechanical and biological characteristics of aneurysm walls.

The goal is to provide a picture of the current knowledge in this field, describe current research efforts, and in particular discuss the role of different factors and processes in the progressive weakening or effective remodeling of the wall. Topics to be considered include: the role of hemodynamics, the role of biomechanics, effects of growth and remodeling, the role of inflammation, the role of lipid accumulation, the role of atherosclerotic changes of the wall, mechanical and structural characteristics of the aneurysm walls, histological and biological characteristics of the aneurysm walls, and imaging the aneurysm wall.

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