A Biochemomechanical Role of Thrombus in Abdominal Aortic Aneurysms

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ABSTRACT

Abdominal aortic aneurysms (AAAs) are localized dilatations of the infrarenal aorta; they typically present in older men and are responsible for increasing morbidity and mortality in our aging population. The vast majority of these lesions develop an intraluminal thrombus, which often occupies most of the dilated region of the lesion. There continues to be significant debate as to whether thrombus is protective or detrimental in terms of mechanical and biological factors. Some suggest that thrombus reduces mechanical stress within the wall of the aneurysm, which could be protective. Others suggest that the thrombus leads to hypoxia within the inner portion of the aneurysmal wall while others suggest that thrombus creates a chronic inflammatory state characterized by increased proteolytic activity; both of these possibilities would obviously be detrimental to lesion integrity. One of the reasons that debate continues is that thrombus volume does not correlate with aneurysm rupture risk.

In this presentation, we will put forth results of a computational model that focuses on where, when, and how much thrombus is expected to form within particular classes of AAAs. Given such information, we will then put forth a hypothesis that it is not thrombus volume that is important, but rather the regions wherein biologically active thrombus contact the aneurysmal wall. Hence, by combining results from a computational fluid dynamics model of thrombus formation and deposition [1] with a computational growth and remodeling model of aneurysmal expansion [2], we will present new results on the possible bio-chemo-mechanical remodeling of an AAA [3].

References

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