

# CFD STUDY OF ABDOMINAL AORTIC ANEURYSMS TO PREDICT RISK OF RUPTURE - THE ROLE OF POROSITY OF THE THROMBOSIS

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## ABSTRACT

Abdominal aortic aneurysm (AAA) is a cardiovascular disease occurring when the aorta becomes weak and develops a balloon expansion in its wall. This balloon diameter can reach sizes up to 4 times the normal aortic diameter, with the diameter enlarging at rates of 0.2–1.0 cm/year. Ruptured aneurysm leads to death in 78% – 94% of diseased aortas [1]

Aneurysm rupture is a biomechanical event that occurs when the mechanical stresses in the wall of the aorta exceed the failure strength of the aortic tissue [2].

In medical practice, when the maximum diameter of AAA exceeds 5 cm it is considered at risk of rupture. Surgical repair is usually not considered until the diameter reaches at least 5 cm. However, It is frequently observed that AAAs with diameters less than 4 cm can rupture which raise the need of finding a more reliable method to assess rupture risk.

The role of the intraluminal thrombus (ILT) which exists in more than 75% of AAA was examined using variable thickness and material properties of the thrombus. For simplification purposes, it is assumed that ILT is a solid material, as sourced from previous studies, even though in reality ILT is a highly porous material with an average porosity of 80% [3]. The porosity of the ILT has been experimentally examined in number of studies [4; 5; 6].

Two recent numerical studies have examined the porosity of ILT using finite element models [7; 8] which have provided useful information about the impact of thrombus porosity on AAA biomechanics but both neglected the actual dynamics of blood mass flow.

In this study, the porosity of ILT was examined using a computational fluid dynamics model to investigate how blood flows within the thrombus and how the information gained can be used to aid in AAA diagnosis and possible reasons for its growth.

## REFERENCES

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