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Conference Abstract

YI 1.8 A Computational Model-Based Study on the Effect of Abdominal Aortic Aneurysm on Pulse Wave Morphology

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Keywords

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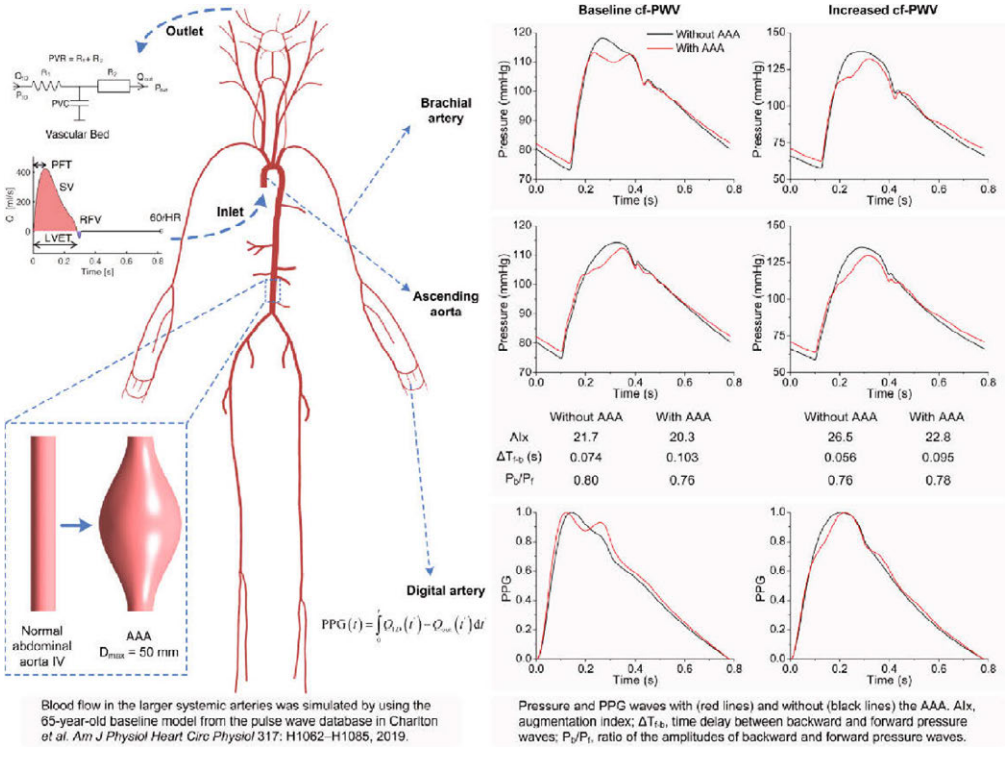
ABSTRACT

Background: Abdominal aortic aneurysm (AAA) is usually asymptomatic and has an extremely high mortality if rupture occurs. Therefore, early detection and intervention are important. However, AAA is most often detected as an accidental finding during clinical imaging for other purposes [1]. Considering that AAA has a systemic impact on the biophysical properties of the cardiovascular system, pulse-wave-based diagnosis of AAA may be a potential approach for effective detection. There have been only a few studies of pulse wave propagation with AAA by using computational modelling or hydraulic simulators [2]. This study aims to provide some basic insights for pulse-wave-based diagnosis of AAA using computational modelling.

Methods: We simulated blood flow in the larger systemic arteries using the 65-year-old baseline model from the pulse wave database in Charlton et al. [3] (see Figure, left). The influence on pulse waveforms of AAA morphology (including shape, maximum diameter and length) was simulated by adjusting the geometry of the abdominal aorta IV. In addition, the influence of the local AAA stiffness and global arterial stiffness (represented by carotid-femoral pulse wave velocity) was investigated by varying the relevant model parameters.

Results: Results show that maximum diameter is the dominant morphological factor in reshaping the pulse waveform, introducing considerable changes in pulse wave indices. Moreover, both local and global arterial stiffness have a considerable impact on wave morphology in the presence of AAA (Figure, right).

Conclusion: AAA produces considerable changes in pulse wave morphology that could be used for AAA detection by using pulse wave analysis.



Figure

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