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Conference Abstract

P.01 Where Does the Reflected Wave Observed in the Ascending Aorta Come from?

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Keywords

1D models
wave propagation
origin of reflections
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ABSTRACT

Background: Wave reflections play a major role in changing the shape of the pressure waveform. Reflections measured at the aortic root (AR) are thought to be due to the tapering of the aorta [1] and multiple reflection sites, however, there is no consensus on the source of those reflected waves. This research aims to better understand the origin of the reflected waves observed in AR.

Methods: A 1D computational model of arterial wave propagation was used to study the reflections in an arterial network that consists of 37 segments of large arteries [2]. A pulse was inserted in 3 peripheral vessels (Figure 1) and followed as it travelled back towards AR. A pressure ratio (PR) was described as the ratio between the pressure at AR to the inlet pressure to allow for comparisons between the effect of various reflected sites.

Results: The pulse wave lost its magnitude travelling back towards the heart. The pulse inserted from the iliac artery could hardly be observed in AR (Figure 2), and only 1% of the waves' magnitude could be detected. PR of the wave inserted at the carotid artery is approximately 18 times larger than those generated at the iliac artery; both measured in the ascending aorta.

Conclusion: Waves reflected from the carotid bifurcation and the cerebral circulation are more likely to be seen in AR in comparison to reflected sites such as renal and iliac arteries. Further work is warranted to establish the contribution of reflections generated from various sites along the arterial bed.

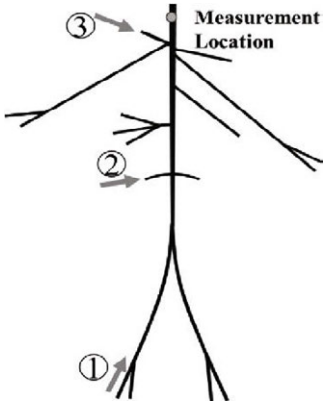

Figure 1 | A schematic representation of the arterial model and locations of pulse insertions.

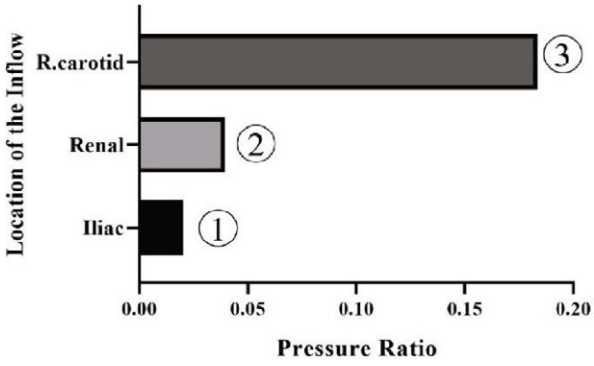

Figure 2 | The ratio of input pressure prescribed from peripheral vessels to the pressure measured at the ascending aorta (PR).

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