

Does low/oscillatory wall shear stress correlate spatially with atherosclerosis?

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Key Words: *Wall shear stress, disturbed flow, hemodynamics, atherosclerosis, arteries*

Low/oscillatory wall shear stress is widely assumed to play a key role in the initiation of atherosclerosis. We wished to ascertain if this consensus is justified. We performed three studies: (1) a systematic review of previous papers comparing the localization of atherosclerotic lesions with the distribution of CFD-derived hemodynamic indicators; (2) a quantitative, point-by-point comparison of published lesion and shear stress maps, employing a novel statistical method; and (3) a qualitative investigation of whether other shear stress metrics correlate better with lesion patterns. The systematic review showed that the correlation is not as secure as commonly assumed. Comparison of lesion and shear stress maps using a more rigorous statistical technique also did not produce a consistently significant relation. A new metric derived to capture the multi-directionality of near-wall blood flow showed striking resemblances to patterns of aortic disease. (Funded by the BHF and the BHF Centre of Research Excellence).

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