Multimodal optoacoustic and multiphoton microscopy of human carotid atheroma.

Abstract:

Carotid artery atherosclerosis is a main cause of stroke. Understanding atherosclerosis biology is critical in the development of targeted prevention and treatment strategies. Consequently, there is demand for advanced tools investigating atheroma pathology. We consider hybrid optoacoustic and multiphoton microscopy for the integrated and complementary interrogation of plaque tissue constituents and their mutual interactions. Herein, we visualize human carotid plaque using a hybrid multimodal imaging system that combines optical resolution optoacoustic (photoacoustic) microscopy, second and third harmonic generation microscopy, and two-photon excitation fluorescence microscopy. Our data suggest more comprehensive insights in the pathophysiology of atheroma formation and destabilization, by enabling congruent visualization of structural and biological features critical for the atherosclerotic process and its acute complications, such as red blood cells and collagen.