

Is optical coherence tomography effective in imaging intravascular thrombus?

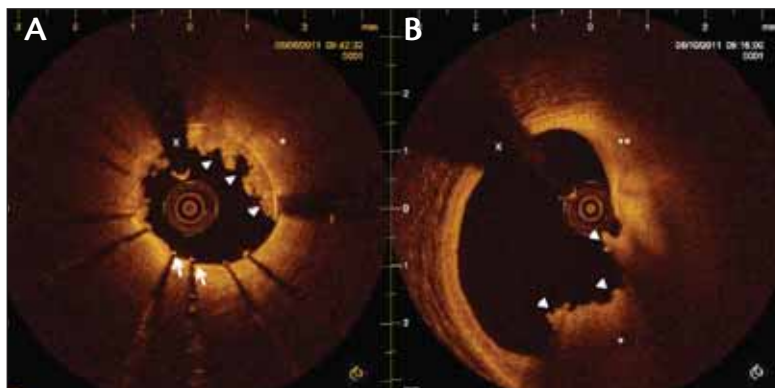
Intravascular optical coherence tomography (OCT) is an imaging modality with high tomographic imaging resolution (approximately 10 μm) that is approximately 10 times greater than its clinical alternative, intravascular ultrasound (IVUS).^{1,2} Recent work showed the feasibility and safety of using OCT in patients undergoing percutaneous coronary intervention (PCI).^{3,4}

While OCT identifies most of the intravascular architectural features as seen with IVUS,^{2,5} OCT also provides several additional morphologic details that aid in detailed plaque characterization.⁵ For example, OCT is superior to IVUS and angiography in detecting thrombus, and it has the unique ability to characterize intracoronary thrombi as either red (red blood cell-rich thrombus) or white (platelet-rich thrombus).

Because red blood cells scatter and attenuate the OCT signal, red thrombus is visualized on OCT as a high-backscattering intravascular globular mass with significant signal attenuation that causes shadowing.⁶ Thrombus, on the other hand, appears as a mass with low attenuation, allowing visualization of vascular structures behind the thrombus. The figure shows examples of the characteristics of red and white thrombi on OCT.

Although the ability to identify and characterize thrombus using OCT is an advance over other imaging modalities, the clinical implications of this information remain unclear. In the setting of PCI, angiographically obvious intracoronary thrombus is a known risk factor for adverse cardiovascular events⁷; however, at high resolution, thrombus is a very common finding on OCT after PCI.

Further quantification and characterization of intracoronary thrombus using OCT may effectively risk stratify patients undergoing PCI and may guide antithrombotic therapy. The ongoing Massachusetts General Hospital OCT Registry, an international collaborative effort that will include 3,000 patients, may ultimately



Characteristics of red and white thrombi. White thrombus within a freshly placed coronary stent (A). Stent struts with shadowing are noted around the circumference of the vessel lumen (arrows). A globular mass (arrowheads) is seen extending from 9 to 3 o'clock, which produced little signal attenuation. Underlying vessel structures (*) are easily visualized. These characteristics are consistent with white thrombus. Otherwise, the OCT image shows good stent apposition. A globular structure is noted (arrowheads) within a large left anterior descending artery (B). The mass attenuates the OCT signal and causes shadowing that obscures underlying vascular structures (*). This increased signal attenuation is likely due to red blood cells within this red thrombus. Additionally, eccentric plaque can be seen from 12 to 3 o'clock with a deep lipid core (**). Shadowing from the coronary guidewire is also shown (x).

answer questions regarding the impact of thrombus burden and characteristics on patient outcomes. ■

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