OCT for Plaque Imaging

Jung-Sun Kim, MD, Ph D
Division of Cardiology, Department of Internal Medicine
Severance Hospital, Yonsei University, Seoul, Korea

Optical coherence tomography (OCT) is a high resolution imaging modality (axial resolution of 10 μm and a lateral resolution of 20 μm) that provides real time cross-sectional images of tissue microstructures using the near infrared light. In most tissues, OCT imaging plays an important role in filling a gap between microscopy and ultrasound in comparison of resolution and imaging depth. Therefore, OCT is capable of resolving microstructural features of atherosclerotic plaques such as thin fibrous cap, lipid core, and intracoronary thrombus, which are thought to be responsible for plaque vulnerability. All plaques identified by OCT are characterized by the loss of the layered structure observed in normal vessels or vessels with intimal hyperplasia. As the various components of atherosclerotic plaques have different optical properties, OCT makes it possible to differentiate them to a great extent. Identification of plaque components by OCT depends on the penetration depth of the incident light beam into the vessel wall. The depth of penetration is greatest for fibrous tissue and least for thrombi with calcium and lipid tissue having intermediate values. Intravascular OCT assessment is useful for the detection of strut coverage, malapposition, and the characterization of neointimal tissue during stent follow-up due to high resolution. OCT also enables detailed assessment of the morphological characteristics of late stent failure, including neoatherosclerosis. Furthermore, OCT with multi-modality imaging including 3D imaging, spectroscopy and microscopic application is now enthusiastically investigated and developed in early stage. This novel approach is able to be an important application to inverstigate the pathophysiology of atherosclerosis and improve clinical outcomes to detect an early period of vulnerability of atheromatous plaque for the prevention of cardiovascular events.