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New Perspectives in Optical Coherence Tomography

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For the first time in the field of ophthalmology, optical coherence tomography (OCT) is used to capture high-resolution, micron-level cross-sectional tomographic information of biological tissue, such as the retina and choroid. It is now widely used for the evaluation of retinal vascular disorders, neo vascular age-related macular degeneration (AMD), central serous chorioretinopathy (CSCR), and other vitreoretinal disorders in this setting. In addition, the method improved its use in a variety of technological and medical settings, including the cardiovascular field, which was validated in animal and human autoptic models. To put it succinctly, in order to reconstruct the sample's axial reflectivity profile, OCT uses low coherence interferometry to measure the delay of light scattered from various depths within the biological tissue.

Low-coherence interferometry is used by OCT to reconstruct the sample's axial reflectivity profile by measuring the echo time delay of either back-reflected or back-scattered lights from various depths within the biological tissue. The intravascular OCT examines the coronary artery wall by performing a helical scanning pattern on the luminal surface of the vessel with miniature side-looking fiber optic probes deployed through a narrow, flexible catheter. Saline flushing is required for blood dilution during OCT imaging because blood strongly scatters light and reduces OCT signals. However, the imaging time and, consequently, the amount of data acquired were constrained by the amount of injected saline volume and its potential ischemic complications [1,2].

Conclusion

OCT has emerged as a useful instrument for interventional cardiologists for precisely characterizing the phenotype of atherosclerotic plaque, customizing stent implantation, and directing more complex interventional procedures. Recent research has also shown that it can be used to evaluate plaque modifications during the follow-ups of patients receiving various pharmacological treatments. OCT's current adoption in catheterization laboratories is still modest, and its impact on clinical practice has been limited, despite its usefulness in a number of settings. This could be primarily attributable to the lack of standardized PCI guidance algorithms and data from prospective clinical trials, as well as the more complicated image interpretation compared to other intracoronary imaging techniques that have a distinct learning curve. In this regard, an innovative artificial intelligence-driven framework for automatic plaque characterization has been developed to overcome inter-operator variability and demonstrate excellent diagnostic accuracy.

Keywords: Optical coherence tomography; Intracoronary imaging techniques; Chorioretinopathy

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