Chapter 2

Interpretation of the Optical Coherence Tomography Image

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Introduction

Optical coherence tomography (OCT) provides noncontact, real-time, and high-resolution imaging of the eye. The device generates cross-sectional images of in vivo tissue structures by measuring the echo time delay and intensity of backscattered or backreflected light.[1-5] Time-domain (TD) OCT uses low-coherence light that is split into 2 beams at a partially reflecting mirror. One beam is directed at the tissue of interest, while the other beam is directed at a mirror attached to a moving reference arm. The beams then recombine at a photodetector, and the interference is assessed to evaluate the intensity of the backreflected light, which relates directly to the structural measurements of the tissue. Spectral-domain (SD) OCT, also known as *Fourier-domain* (FD) OCT, assesses the signal without moving the reference arm, greatly reducing acquisition time. SD-OCT encodes the time delay at each depth simultaneously by taking the Fourier transform of the interference spectrum of the light signals. In addition, the device uses a broader wavelength that allows further improvements to image resolution. Taken together, this allows SD-OCT to acquire greater amounts of data at higher speed and better resolution than TD-OCT, making it a remarkable tool for intraocular disease evaluation.[6-8]

OCT images provide diagnostically important information on a wide range of ocular pathologies, including macular edema, retinal detachment, alterations in the vitreoretinal interface, macular hole, age-related macular degeneration, diabetic retinopathy, glaucoma, and others. A wide range of OCT scanning protocols may be used to obtain optimum diagnostic information on specific structures such as the macula or optic disc. In addition to providing direct visualization of both the volumetric structure and the cross-sectional layers of retina, computer image processing can be applied to identify and measure layers of the retina automatically. Quantitative measurements obtained with SD-OCT may be displayed with topographic maps, such as retinal thickness or retinal nerve fiber layer (RNFL) thickness maps, which facilitate direct comparison and registration with fundus images or fluorescein

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