Appendix 1: Optical coherence Tomography - A Brief Guide

Optical coherence tomography (OCT) is an optical technology that can perform tomographic cross-sectional imaging in micron scale, in real time and in vivo. Cross-sectional images in OCT are generated by scanning an optical beam across the tissue and measuring intensity and the time delay of light that is backscattered from the sample. Then the delay of light may be converted to distances with an extra knowledge about optical properties of a sample. The first generation of OCT systems, including the commercial Stratus OCT (Zeiss Meditec), performed measurements of the time delay of light using an interferometer with a mechanical scanning of the reference arm*. In this system different delays of light waves are measured sequentially at different times as the optical path length is scanned.
Therefore, this technique is known as Time domain OCT (TdOCT). Another and much more efficient way of detecting OCT signals is so called Fourier domain OCT (FdOCT). This method can improve 200 times the registration speed of OCT instruments when compared to TdOCT. In FdOCT the delays of light are measured by detecting spectrum of the light*. Such detection can be performed in two ways: (1) spectral OCT (SOCT; also called “Spectral domain OCT”-SdOCT), which uses a spectrometer as the detector and a light source identical to that used in TdOCT; and (2) swept source OCT (also called optical frequency domain imaging, or OFDI), which uses fast, tunable, “swept” lasers. Figure above shows a schematic diagram that differentiates basic detection techniques used in ophthalmic OCT imaging.

*More comprehensive description of the OCT technique may be found in following review publications:
