A brief note on optical coherence tomography: An advanced imaging technique.

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About the study

Optical Coherence Tomography (OCT) is a brand-new optical imaging technique. OCT uses backscattered or back reflected light to achieve high-resolution cross-sectional tomographic imaging of the interior microstructure of materials and biologic systems. OCT pictures are two-dimensional data sets that depict the optical backscattering in a cross-sectional plane of tissue. Image resolutions of 1 to 15 m may be obtained, which is one to two orders of magnitude more than conventional ultrasonography. Imaging may be done in real time and *in situ.* This technology's distinct properties enable a wide range of scientific and therapeutic applications. This review article presents an overview of Optical Coherence Tomography (OCT) technology, its history, and possible scientific and therapeutic applications.

OCT, which uses optical backscattering or back reflection measurements to image the interior cross-sectional microstructure of tissues, was initially shown in 1991. As examples of imaging in transparent, weakly scattering media and nontransparent, substantially scattering media, OCT imaging was accomplished *in vitro* in the human retina and atherosclerotic plaque. OCT was first used for imaging in the eye, and it has had the greatest clinical impact in ophthalmology to date. In 1993, the first *in vivo* tomograms of the human optic disc and macula were shown.

OCT allows for the noncontact, noninvasive imaging of the anterior eye, as well as the imaging of morphologic characteristics of the human retina such as the fovea and optic disc. The organisation has investigated approximately 10,000 patients in partnership with the New England Eye Center. In 1996, the technique was transferred to industry and commercialised for eye diagnostics (Humphrey Systems, Dublin, CA). Several clinical trials have been conducted in recent years by various parties.

More recently, developments in OCT technology have enabled imaging of non-transparent tissues, allowing OCT to be used in a wide range of medical specialties. The optical attenuation caused by tissue scattering and absorption limits imaging depth. In most tissues, however, imaging up to 2 to 3 mm deep is possible. This is the same scale that traditional biopsies and histology routinely photograph. Although the imaging depths are not as deep as with ultrasound, the resolution of OCT is 10 to 100 times better than that of typical clinical ultrasonography. *In vitro*, OCT has been used to assess artery disease and distinguish plaque shapes. *In vitro* imaging studies have also been conducted to evaluate potential uses in dermatology, gastrointestinal, urology, gynaecology, surgery, neurosurgery, and rheumatology.

Numerous advancements in OCT technology have also occurred. High-speed real-time OCT imaging at acquisition rates of many frames per second has been demonstrated. Using innovative laser light sources, high-resolution and ultrahigh-resolution OCT imaging has been performed, with axial resolutions as high as 1 m obtained. OCT imaging at the cellular level has recently been achieved in developmental biology specimens. OCT has been linked to catheters, endoscopes, and laparoscopes, allowing for interior body imaging. In an animal model, catheter and endoscope OCT imaging of the gastrointestinal, pulmonary, and urinary systems, as well as arterial imaging, has been demonstrated *in vivo*. Many research organisations are actively doing preliminary clinical investigations

Conclusion

OCT imaging is similar to ultrasound B mode imaging, however it employs light instead of sound. Because of the similarities between OCT and ultrasound imaging, it is useful to begin by examining the variables that influence OCT imaging vs ultrasound imaging. To do cross-sectional or tomographic imaging, the internal structure of materials or tissues must be measured initially along a single axial or longitudinal dimension. The determination of axial distance or range information inside the material or tissue is the initial stage in creating a tomographic picture in OCT. OCT comes in a variety of forms, but in essence, it conducts imaging by measuring the echo time delay and intensity of backscattered or back reflected light from internal microstructures in materials or structures.

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