Systems and methods for ophthalmic surgical microscope mounted optical coherence tomography

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Publication(s)

External Link(s)

- Dr. Joseph Izatt's Research Website
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Value Proposition

Surgical visualization has changed drastically since its inception, incorporating larger, more advanced optics toward increasing illumination and field-of-view (FOV). However, the limiting factor in vitreoretinal surgery remains the ability to distinguish between tissues with subtle contrast and to judge the location of an object relative to other retinal substructures. Optical coherence tomography (OCT) is uniquely suited for vitreoretinal surgery where multiple layers of the retinal structure are readily accessible, and where high resolution cross-sectional viewing would immediately have an impact on surgery as it is performed today. This improvement in surgical visualization would impact the treatment of a wide range of ocular diseases including diabetic retinopathy with membranes in the macula, macular holes, epiretinal membranes, and retinal detachments. Real-time cross-sectional OCT imaging would also provide critical information relevant to the location and deformation of structures that may shift during surgery.

Technology

A new Duke device using an intraoperative microscope-mounted optical coherence tomography system (MMOCT) has been demonstrated in vivo human retinal imaging. This optomechanical design adapts an Oculus Binocular Indirect Ophthalmo Microscope (BIOM3), suspended from an ophthalmic surgical microscope, with spectral domain optical coherence tomography (SD-OCT) scanning and relay optics. The MMOCT enables wide-field noncontact real-time cross-sectional imaging of retinal structure, allowing for SD-OCT augmented intrasurgical microscopy for intraocular visualization. The axial and lateral resolution of the MMOCT have been experimentally quantified and demonstrate fundus imaging at a 20 Hz frame rate.