Novel approaches in optical coherence tomography for high-resolution imaging of biological tissues

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Optical coherence tomography (OCT) is an established technique for three-dimensional imaging of biological tissues with micrometer-scale resolution. Commercially available OCT devices are employed in diverse medical applications, notably in ophthalmology. OCT has also begun to be used in cardiology and has shown promise in dermatology. Imaging at high resolution with OCT is of particular interest to resolve subtle morphological changes of tissues for early medical diagnosis. Two novel high-resolution OCT techniques will be presented: Full-Field Optical Coherence Tomography (FF-OCT) and Line-field Confocal Optical Coherence Tomography (LC-OCT). FF-OCM is based on low-coherence interference microscopy, using full-field illumination with a low-coherence light source and detection with an area camera to acquire *en face* tomographic images. FF-OCM benefits from the transverse imaging resolution of optical microscopy (~ 1.0 µm) along with the capacity of optical axial sectioning at micrometer-scale resolution. LC-OCT was introduced very recently for high-resolution B-scan (cross-sectional) imaging. The technique is based on line illumination and detection using a broadband spatially coherent light source and a line-scan camera in a two-beam interference microscope. Isotropic spatial resolution of ~ 1.0 µm is achieved. *In vivo* cellular-level resolution imaging of skin is demonstrated in real-time with a penetration of ~ 500 µm.