Line-field confocal optical coherence tomography operating simultaneously at 800 nm and 1300 nm center wavelengths

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100-word text summary

Line-field confocal optical coherence tomography (LC-OCT) is a new technology that combines the principles of time-domain OCT and reflectance confocal microscopy for cross-sectional imaging of biological samples *in vivo* at a cellular level in real-time. Dual-band LC-OCT is an extension of LC-OCT, operating simultaneously in two spectral bands. The short wavelengths yield ultrahigh-resolution images whereas the longer display extended penetration depth. Greyscale compounding has been implemented to yield a single greyscale image with both high resolution and extended depth penetration. Color fusion was done to emphasize differences of spectroscopic properties in the sample and to enhance the image contrast. The technology is applied in dermatology.

250-word text abstract

Line-field confocal optical coherence tomography (LC-OCT) is a new technology for cross-sectional imaging of biological samples *in vivo*. LC-OCT is the combination of time-domain optical coherence tomography and reflectance confocal microscopy. The use of a supercontinuum laser as a broadband light source and high numerical aperture objectives allows ultrahigh-resolution imaging. Line illumination of the sample together with line detection using a linescan camera allow an entire B-scan to be acquired in a single scan. The focus of the microscope objective can then be dynamically adjusted as the sample is scanned in depth while maintaining a framerate high enough (10Hz) to allow real-time *in vivo* imaging. Therefore, a high numerical aperture can be used, thus improving transverse resolution and detection sensitivity through an efficient confocal gating. Dual-band LC-OCT takes advantage of the scattering and absorption dependence with optical wavelength to obtain more information about the sample by acquiring images simultaneously in two bands centered at 800 nm and 1300 nm. The first yields ultrahigh-resolution images, while the second has an extended penetration depth. Greyscale compounding has been implemented to combine the specific advantages of each band regarding resolution and penetration into a single greyscale image. An isotropic resolution of about 1 µm in the superficial parts with a depth penetration of about 700 µm could be achieved. Associating the two images to create a colored image can emphasize differences of local spectroscopic properties of the sample and enhance image contrast. The technology is applied in dermatology for the non-invasive diagnosis of skin cancers.