



DERMOSCOPY AND SKIN IMAGING

LINE-FIELD CONFOCAL OPTICAL COHERENCE TOMOGRAPHY: PRESENTATION OF THE TECHNIQUE AND ITS APPLICATIONS IN DERMATOLOGY

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Introduction: Several optical techniques have been introduced for non-invasively imaging the skin. In particular, reflectance confocal microscopy provides high lateral resolution (~1 μm) but low penetration depth (~250 μm) and images in the horizontal plane (en face), unlike histopathology; optical coherence tomography (OCT) provides high penetration depth (570-1000 μm) and images in the vertical plane (cross-sectional), but low lateral resolution (3-10 μm).

Objectives: To present line-field confocal (LC)-OCT, a novel imaging technique able to combine the technical advantages of RCM and conventional OCT and overcome their drawbacks; and (ii) to give an overview of its numerous applications in dermatology.

Materials & Methods: LC-OCT provides high-speed high-resolution B-scan imaging of semi-transparent objects including biological tissues. It is based on a two-beam interference microscope with line illumination and detection using a broadband spatially coherent light source and a line-scan camera. Spatial resolution of 1.3x1.1 μm (lateral \times axial) is achieved. In vivo cellular resolution imaging of human skin is demonstrated at 10 frames per second with a penetration depth of ~500 μm . A LC-OCT prototype was provided to our departments in order to test it on several cutaneous conditions. Imaging was performed in areas highlighted with binder hole reinforcement stickers (internal diameter: 6 mm). Punch biopsies (diameter: 6 mm) were then performed within the stickers in order to investigate correlations with histopathology.

Results: LC-OCT images/videos and punch biopsies of 5 normal skin locations, 10 benign/malignant melanocytic lesions, 10 non-melanoma skin cancers, 10 seborrheic keratoses, 10 angiomas and 10 inflammatory/infectious conditions were acquired. High





correlation was observed between the LC-OCT and histopathological images for all cases by 2 different observers.

Conclusions: We presented LC-OCT, a novel technique for in vivo cellular-level imaging of the skin. LC-OCT is of particular interest in dermatology as it provides cross-sectional images with near histological resolution in real-time.

