Optical Radiomic Signatures Derived from Optical Coherence Tomography Images to Improve Identification of Melanoma

The current gold standard for the clinical diagnosis of melanoma is excisional biopsy and histopathologic analysis. Approximately 15-30 benign lesions are biopsied to diagnose each melanoma. Additionally, biopsies are invasive and result in pain, anxiety, scarring and disfigurement of patients which can add an additional burden to the health care system. Among several imaging techniques developed to enhance melanoma diagnosis, optical coherence tomography (OCT), with its high-resolution and intermediate penetration depth, can potentially provide required diagnostic information noninvasively. Here we present an image analysis algorithm, 'optical properties extraction (OPE)', that improves the specificity and sensitivity of OCT by identifying unique optical radiomic signatures pertinent to melanoma detection. We evaluated the performance of the algorithm using several tissue-mimicking phantoms and then tested the OPE algorithm on sixty-nine human subjects. Our data show that benign nevi and melanoma can be differentiated with 97% sensitivity and 98% specificity. These findings suggest that adoption of the OPE algorithm in the clinic can lead to improvements in melanoma diagnosis and patient experience.

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