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Noninvasive nondestructive comparison of pigmented and Non-Pigmented Melanomas using vibrational Optical Coherence Tomography

Abstract:

We have developed a novel new noninvasive technique termed vibrational optical coherence tomography (VOCT) to optically image and measure the resonant frequency of cellular, blood vessel, papillary collagen, and fibrotic tissue in the skin. Preliminary results on normal skin indicate that cells, blood vessels, and papillary collagen have resonant frequencies of 50, 100, and 150 Hz, respectively. Additional resonant frequencies at 80, 130, and 250-260 Hz are seen in cancerous lesions, corresponding to cancer associated fibroblasts, new thin blood vessels and fibrotic tissue, respectively. VOCT has been used to compare skin lesions including pigmented and nonpigmented melanomas to noninvasively differentiate between these cancers based on OCT images and biophysical data. The results indicate that each of these lesions have unique physical properties and OCT images that can be used to noninvasively differentiate between pigmented lesions and different forms of melanomas. Color-coded OCT images reveal that in situ and nodular melanomas have different morphological characteristics that can be evaluated noninvasively in vivo using OCT images and resonant frequency profiles. Based on dermatopathology the clear margins of these lesions are not morphological and biophysically identical to normal skin. However, they have different properties from those of malignant melanomas. The results of this study suggest that the different subtypes of melanoma can be noninvasively evaluated via VOCT. Since VOCT data can be collected remotely over the internet, it can be used to provide critical information on skin lesions to General Practitioners in areas where Dermatologists are in short supply.

Biography

Dr. Frederick H. Silver is a Professor of Pathology and Laboratory Medicine at Robert Wood Johnson Medical School, Rutgers, the State University of New Jersey. He did his Ph.D. in Polymer Science and Engineering at M.I.T. followed by a postdoctoral fellowship in Developmental Medicine at Mass General Hospital in Boston, MA. Dr. Silver has published over 250 peer reviewed scientific papers, 5 textbooks on biomaterials and biomedical engineering, and has over 21 patents issued and pending. He is a section editor for Biomaterials for the MDPI Journal Biomolecules. He is an inventor of vibrational optical coherence tomography.