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Use of vibrational optical coherence tomography in dermatology

Abstract:

We have developed a new noninvasive technique termed vibrational optical coherence tomography (VOCT) to image and measure the elastic modulus of cellular, blood vessel, collagen, and fibrotic tissue in the skin. Clinical results of studies 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.

This talk will focus on the use of VOCT to noninvasively differentiate between melanomas, basal cell and squamous cell carcinomas, seborrheic keratoses and normal skin. Additional information will be presented to analyze wound healing of skin as well as treatments to skin including needling, hyaluronic acid injections, and removal of the stratum corneum. The use of VOCT leads to color-coded OCT images of skin within 60 seconds that can be used to evaluate treatments to the skin as well as provide quantitative information concerning regeneration of the epidermis and dermis. The use of VOCT to evaluate initial skin conditions and post treatment results provides a means for Dermatologists to rapidly noninvasively evaluate the effects of different treatments and their outcomes. The information generated will include color-coded images of what patient skin looked like before and after treatment. New collagen production and localization after skin rejuvenation procedures can be followed using this procedure. Since the VOCT instrument and data collection can be accomplished remotely over the internet, it can also be used to provide critical information on skin via telemedicine.

Biography

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, 6 textbooks on biomaterials and biomedical engineering, and has over 22 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.