Gavin Publishers
Gavin Journal of Dermatology Research and Therapy
Volume 2016; Pages 2
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Editorial

Optical Coherence Tomography for Skin Cancer Screening

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Citation: Levine A, Wang K, Markowitz O (2016) Optical Coherence Tomography for Skin Cancer Screening. Gavin J Dermatol Res Ther 2016: 24-25.

Received: 23 July, 2016; **Accepted:** 29 July, 2016; **Published:** 12 August, 2016

Editorial

Skin cancer is the most common malignancy worldwide. Non-Melanoma Skin Cancers (NMSC), including Basal Cell Carcinomas (BCC) and Squamous Cell Carcinomas (SCC) are the most common, constituting around 80 percent of all skin cancers [1]. It is estimated that approximately 3.5 million new cases of NMSC occur every year in the United States, exceeding that of all other cancers combined [2-5]. In contrast, melanoma accounts for less than one percent of skin cancer cases, but the vast majority of skin cancer deaths [6]. The incidence of NMSC rises rapidly with patient age and has been increasing annually by between three and eight percent since 1960 [4,5,7]. In addition to causing illness and death, skin cancer is a huge economic burden to the United States. Skin cancer treatment is estimated to cost about $8.1 billion in the U.S. each year, with about $4.8 billion for NMSC [8]. This does not take into account the intangible costs associated with decreased quality of life [9,10,11].

Early detection seems to be the most promising way to improve morbidity and mortality. However, as of 2015, the U.S. Preventive Services Task Force (USPSTF) reports insufficient evidence to recommend routine screening for skin cancer [12]. The USPSTF rationale is that clinical examination of skin lesions has low diagnostic accuracy, which may lead to misdiagnosis and or over diagnosis of skin cancer [12]. Clinical and dermascopic imaging of skin lesions followed by biopsies of suspicious lesions remains the standard for many dermatologists. The Journal Dermatologic Surgery recently reported that nearly 80% of all skin biopsies performed result in benign diagnoses [13]. Given this challenge, improved diagnostic modalities are being developed to provide more precise and accurate detection of suspicious lesions, decreasing the false positive rates of biopsy.

Over the past decade, noninvasive imaging techniques, including Optical Coherence Tomography (OCT) and Reflectance Confocal Microscopy (RCM), are increasingly being used in research and clinical settings to assist in the diagnosis and treatment of a variety of skin conditions. These devices are appealing because they enable real-time, in vivo imaging of suspicious lesions without tissue biopsies. Three factors in assessing the quality of novel imaging devices in dermatology include Field-of-View (FOV), cellular clarity, and depth penetration [14]. RCM provide the highest cellular resolution but a more limited depth penetration and FOV. OCT utilizes reflected light to produce cross-sectional subcutaneous images of tissue at a higher resolution than ultrasound, with a depth penetration of two millimeters and a spatial resolution better than 7.5 μm [15-19]. OCT has been a useful device to monitor lesions given its increased FOV and depth penetration. Recently, the development of Speckle-Variance OCT (SV-OCT) allows for imaging of tissue vasculature, providing greater detail for discrimination of malignant lesions, as they often display discrete foci of neovascularization [20,21].There are many reports in the literature showing the usefulness of OCT in the diagnosis of non-melanocytic lesions of the skin [15-19]. OCT has been shown to increase the sensitivity and thus improve the false positive rate of correct diagnosis over clinical examination alone; thereby reducing the costs and cosmetic concerns associated withexcisions of suspicious but benign skin lesions [15-19].

The use of OCT has also been shown to be useful in defining tumor margins of non-melanoma skin cancers

beyond the clinically apparent extent of tumor prior to resection [22,23,24].Wang et al. have shown that the use of OCT can refine clinically estimated borders for Mohs Microscopic Surgery (MMS) for BCC and potentially reduce the area size of excised tissue compared to the clinical eye [22]. Pomerantz et al. [23] showed that the margins marked by the use of OCT before Mohs surgery closely approximated the final MMS defect [23]. Finally, Alawi et al. [24] showed that OCT can assist to correctly diagnose a suspicious NMSC lesion, accurately define the lateral margins, and detect residual tumor foci post-excision to ensure complete removal [24]. This could potentially reduce the number of layers required for removal and thus decrease operative time as well as minimize the need for multiple office visits for re-excision of the tumor. These noninvasive imaging devices are not only useful for diagnosing skin cancers, but are also helpful in distinguishing and monitoring benign skin growths and dermatologic conditions, including psoriasis, cutaneous inflammation and onychomycosis.

OCT remains an innovative and attractive imaging device that has the potential to increase patient survival by improving diagnostic accuracy, thereby leading to earlier detection of skin cancers. The use of noninvasive imaging devices will also result in fewer biopsies of benign lesions, minimizing the cosmetic concerns associated with more invasive procedures. This is not only cost effective for both patients and physicians alike, but will enhance patient care in the future. Initial studies have begun to show the tremendous potential for OCT in everyday clinical practice as a cutting-edge device that elevates the field of dermatology, and there exists a continuing demand for further initiative in research and clinical applicability.

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