VIEW POINT

Optical coherence tomography in oral cancer detection

Dominic Augustine[1], Roopa S. Rao[1], Shankargouda Patil[2]

[1]Department of Oral and Maxillofacial Pathology, Faculty of Dental Sciences, M S Ramaiah University of Applied Sciences, Bengaluru, Karnataka, India, [2]College of Dentistry, Jazan University, Jazan, Saudi Arabia

Correspondence
Dominic Augustine, Department of Oral and Maxillofacial Pathology, Faculty of Dental Sciences, M S Ramaiah University of Applied Sciences, M S R Nagar, Bengaluru - 560 054, Karnataka, India. E-mail: dominic2germain@gmail.com

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Majority of oral cancers develop from potentially malignant lesions. The malignant transformation rates of oral premalignant lesions are reported to be 1-7% for homogeneous, thick leukoplakia, 4-15% for granular or verruciform leukoplakia, 18-47% for erythroleukoplakia, 4-11% for moderate dysplasia, and 20-35% for severe dysplasia.[1] The high rate of malignant transformation for potentially malignant lesions also indicates the importance of early diagnosis and early treatment.

Most of the potentially malignant lesions are non-homogeneous in nature. Hyperkeratosis and acanthosis may be present in one part of the lesion while others areas may show epithelial dysplasia, carcinoma *in situ*, or invasive carcinoma.

This mandates the need for multiple biopsies on several occasions. To alleviate patients' anxiety from undergoing multiple procedures one of the best non-invasive ways to help choose the appropriate site for biopsy is to use the optic coherence tomography (OCT) to detect oral precancers and cancers.[2]

OCT was first reported by Fujimoto *et al.* in 1991.[3] It has been widely used in numerous clinical applications including dermatology and dentistry. OCT is a non-invasive, optical diagnostic tool based on interferometers. It uses a low-coherence broadband near-infrared light source and obtains an excellent spatial resolution (~20 μm) and real-time images. It was first used *in vitro* in human retina and atherosclerotic plaque cases.[4-7]

Tsai *et al.* utilized swept-source - OCT to differentiate various lesions including mild dysplasia, moderate dysplasia, early-stage squamous cell carcinoma, and well-developed SCC.[8]

Cancer biology and drug response in preclinical settings have been evaluated by researchers using OCT. A significant application of OCT in preclinical cancer research has been in the field of angiography. The ability of OCT to repeatedly image over broad fields makes it ideal for studies of tumor angiogenesis and vascular response across a variety of sites.[9]

OCT has also been employed to characterize angiogenesis in xenograft models.[10] In a further example of hybrid studies combining OCT with other modalities, an instrument capable of dynamically imaging oxygen supply and demand in tumors has been demonstrated.[11]

As OCT can pinpoint epithelial changes, this imaging tool has sought potential broad applications in other mucosal lesions such as vesicullo bullous and vascular lesions. The possibility of this application for bone-related disease imaging is an interesting research prospect. Future research should focus on the suitable wavelength of the light source of OCT for better observation of oral diseases.[12] Faster and higher resolution OCT systems may replace the need for biopsies in many situations in the near future.

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