

Invited Editorial 2

Millimetre Waves in The Detection of Oral Cancer

Santosh Kumar¹ , Namrata Dagli² , Mainul Haque³ 

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Although biopsy is considered a gold standard in diagnosing cancers, its time-consuming and invasive limitations render its use unsuitable for screening¹. Non-invasive methods such as Toluidine blue test, exfoliative cytology, and optical fluorescence are used as an adjunct with visual inspection and palpation but often lack sensitivity and specificity². In vivo microscopy (High-resolution micro-endoscopy, optical coherence tomography, confocal reflectance microscopy, multiphoton imaging, etc.) has good accuracy, but high costs limit its use³. Hence, we would like to stress the use of non-ionizing millimeter waves (MmW) in dental clinics for chairside real-time 3-D imaging of oral cancer and precancerous lesions.

MmW has recently been explored for its potential for real-time 3-D imaging to diagnose pathological changes in the skin. Millimetre waves are nonionizing electromagnetic waves with a frequency between 30-300GHz and are generally used in cell phones and body scanners in airports. A study on the diagnostic

potential of MmW has shown that frequency of 98GHz distinguished between cancerous and noncancerous tissues with 97% sensitivity and 98% specificity⁴. Developing a hand held device for intraoral use can be a great adjunct in the early non-invasive diagnosis of oral cancerous and precancerous lesions.

A biopsy is very useful for confirmatory diagnosis. Still, it cannot be used for screening as it involves the risk of facilitating metastasis by invading and destroying the natural barrier of connective tissue and basement membrane⁵. In addition to reducing the need for biopsy, intraoral, cancer diagnostic devices can reduce patient apprehension and discomfort. It will allow frequent monitoring of cancerous and precancerous lesions. With the development of this technology, screening of oral cancers will be possible in dental clinics and could be included as a part of a routine oral examination.

It has high sensitivity and specificity; therefore, the chances for false positive and negative results would be reduced. Less specific screening tests lead to

1. Department of Periodontology, Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujarat-382422, India.
2. Adjunct Research Faculty, Karnavati Scientific Research Center, Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujarat-382422, India.
3. Unit of Pharmacology. Faculty of Medicine and Defence Health, National Defence University of Malaysia, Kem Perdana Sungai Besi, 57000 Kuala Lumpur, Malaysia.

Correspondence:

Santosh Kumar. Department of Periodontology and Implantology, Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujarat-382422, India. **Email:** drsantoshkumar2004@gmail.com. Cell Phone: +91 96018 00379.

Mainul Haque. Unit of Pharmacology. Faculty of Medicine and Defence Health, Universiti Pertahanan Nasional Malaysia (National Defence University of Malaysia), Kem Perdana Sungai Besi, 57000 Kuala Lumpur, Malaysia. **Email:** runurono@gmail.com. mainul@upnm.edu.my. Cell Phone: +60109265543.

unnecessary confirmatory invasive diagnostic procedures and patient anxiety. In contrast, less sensitivity provides false reassurance and may result in delayed diagnosis and overtreatment of benign lesions⁶.

The only point of concern is that MmW has been reported to be carcinogenic by IARC⁷. Therefore, before the widespread use of these devices, guidelines to ensure safety must be developed for the particular frequency range used in diagnosis, especially for healthcare providers who would be indirectly exposed to these radiations for a long duration. More trials need to be conducted to find the most effective frequency for diagnosis of oral tissues and duration of exposure.

Early diagnosis is crucial in the case of oral carcinomas as the late diagnosis is directly associated with a shorter survival duration and poor prognosis. Despite easy accessibility, oral cancers and precancerous lesions are often diagnosed in advanced stages. Routine oral inspection at regular intervals should be emphasized to detect cancers at an early stage. Fabricating a handy device used in dental clinics can aid in the early detection of oral carcinoma. It seems to be an answer to the quest for a diagnostic method that is non-invasive, highly sensitive, highly specific, and suitable for widespread use. It could revolutionize cancer management and aid in early diagnosis, improving patients' quality of

life and survival duration.

Consent for Publication

The author reviewed and approved the final version and has agreed to be accountable for all aspects of the work, including any accuracy or integrity issues.

Disclosure

The author declares that they do not have any financial involvement or affiliations with any organization, association, or entity directly or indirectly with the subject matter or materials presented in this article. This includes honoraria, expert testimony, employment, ownership of stocks or options, patents, or grants received or pending royalties.

Data Availability

Information is taken from freely available sources for this editorial.

Authorship Contribution

All authors contributed significantly to work, whether in the conception, design, utilisation, collection, analysis, and interpretation of data or all these areas. They also participated in the article's drafting, revision, or critical review, gave their final approval for the version that would be published decided on the journal to which the article would be submitted, and made the responsible decision to be held accountable for all aspects of the work

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