EDITORIAL

Use of Toothbrush as a Cost-effective Noninvasive Source of DNA for Molecular Oral Oncology Investigations during COVID Pandemic

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Dear Editor,

Oral cancer, specifically oral squamous cell carcinoma (OSCC) has shown to be a major contributor to morbidity and mortality among tobacco/alcohol users.[1,2] A prominent area of research in oral oncology is in the development of economical noninvasive screening tools capable of stratifying high-risk individuals, especially among those with associated habits. Cancer cytopathology has developed into a major branch in onco-diagnostics. Its noninvasive nature has led to its acceptance as a screening tool, especially in larger populations. The major hindrance is that medical personnel is often required to collect the sample using cytological tools such as the cytobrush.[3]

Coronavirus disease-2019 (COVID-19) pandemic has led to a massive change in the protocols employed in the field of diagnostics including onco-diagnostics. Fear of infection has led to a drastic reduction in the number of patients willing to visit an onco-diagnostic center.[4] Thus, there is an urgent need to formulate sample collecting modalities that do not require the aid of medical personnel or a visit to a hospital by the patient. Forensic studies have shown that a DNA sample could be retrieved from a person's belongings including a toothbrush.[5] The DNA isolated from a toothbrush carries a greater weightage in oral oncology as the toothbrush-retrieved samples could be a representation of the current oral status.

Although toothbrush-based DNA has shown to have major application in forensics including personal identification, there are few limitations. A major limitation is the representativeness of the toothbrush-retrieved sample. As OSCC occurs in the oral soft tissues and the toothbrush used in routine practice is largely applied to oral hard tissues, the collected samples may not be a good representation of any underlying soft tissue pathology. A second limitation is that the toothpaste used on the brush contains PCR inhibitors.[6] Thus, constant exposure to the paste would drastically reduce the total amount of available DNA. Although at present DNA retrieved from toothbrushes for forensic investigations is considered to be sufficient,[5] the same cannot be said for oncological assessment. The number of investigations required in oncology would be relatively higher and would require a greater amount of DNA.

Few modifications are required to overcome the above-mentioned limitations. With relation to the quantity of the retrieved DNA, Bandhaya et al.[6] inferred that five bristle bundles retrieved a higher DNA yield than 10 bristle bundles. In addition, as the use of toothpaste is to aid in cleaning the tooth, there is no need to use any paste in the toothbrush used for sample collection, thus eliminating the interference of the PCR inhibitors in the paste. Also, as the toothbrush would be used on soft tissues, a relatively softer bristle must be used to avoid any potential soft tissue injury.

To conclude, for optimal retrieval of DNA from toothbrushes for oncological investigations, a toothbrush with softer and fewer bristles must be applied on representative soft tissues. In cases wherein their no representative area is identified by the patients, then the toothbrush must be applied in general on the oral soft tissue. High-risk individuals including chronic users of tobacco/alcohol could be potentially benefited from a toothbrush-based sample collection. Patients with samples identified to have oncological changes could be asked to visit the hospital to validate the findings. Thus, toothbrush-based DNA retrieval could serve as an economic noninvasive oncological screening tool for the high-risk population, especially during the current pandemic.

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