EDITORIAL

Can Artificial Intelligence (AI) assist in the diagnosis of oral mucosal lesions and/or oral cancer?

Currently, the gold standard for the definitive diagnosis of all oral mucosal lesions remains a scalpel biopsy and histopathologic diagnosis. The concept of an invasive procedure is often poorly perceived by patients who either are fearful of a "cancer" diagnosis or are fearful of the procedure itself. Unfortunately, either can lead to delays in diagnosis, and in the case of a malignant lesion, the danger of disease progression, which would negatively impact prognosis. Furthermore, access to care and/or access to a skilled provider who can perform the appropriate biopsy can be problematic for many patients and usually for those at risk of having malignant lesions. There is an urgent need to employ the various technological advances already in use in other fields of health care in the accurate diagnosis of oral mucosal lesions.

Artificial intelligence (AI) is a branch of computer science and engineering that designs and trains computers to perform complex tasks that mimic human behavior. Machine learning (ML), a subset of AI, due to its ability to process large data sets and develop decision making capacities, has been used in various fields in health care. The ML technologies have demonstrated high accuracy in predicting the risk for the development of a disease such as diabetes, or the prediction of progression for various cancers such as breast, gastric, and oral cavity.

If AI technologies could accurately diagnose an oral mucosal lesion as malignant, a patient's life could be significantly impacted by an early and appropriate intervention. Alternatively, if AI technologies could accurately diagnose a mucosal lesion as nonmalignant, unnecessary stress could be prevented for both the patient and primary provider. The application of AI technologies for this specific purpose is under intense exploration in the last decade in both underdeveloped as well as developed countries. Clinician-researchers across the globe have used metrics (e.g., precision/concordance/sensitivity/specificity and/or accuracy) in their attempts to evaluate how AI technologies can be employed in diagnosing oral cancer, or in selecting the most diagnostic biopsy site of a lesion, or in diagnosing oral potential malignant disorders (OPMDs), among other areas of clinical interest.[1,3,5]

As mentioned, ML requires large and relative homogenous date sets to perform tasks by learning patterns and then resolving "issues" or making decisions without human input. The patters in our behaviors and habits are easily recognizable and are the reason why "Alexa," "Siri," "Amazon," or "Google," etc. "knows" our preferences and can select or make suggestions for music, movies, news, or material goods we may "like." In health care, large, and, to an acceptable degree, homogenous data sets exist and/or can be collected from electronic heath records in some clinical areas, like the vital signs from the anesthesia machines in the operating rooms, intensive care units, or ambulances and in the fields such as dermatology or ophthalmology, due to the standardization of recording and reporting.[2,4] The AI technologies can extract valuable information from these data sets to be used in quality assessment, improve care and outcomes, or monitor blood levels (e.g., blood glucose), and deliver the appropriate medication doses.

In dentistry, caries in children can be diagnosed/detected by a smartphone app downloaded in the parents'/caregivers' phones.[6] In dermatology, the consistent textural features of basal cell carcinoma and melanoma lesions coupled with the abundance of clinical images of these lesions have allowed for a high accuracy in diagnosis (>98%) of melanoma with use of photographs alone.[4] The extreme variability in clinical presentation of oral cancer and OPMDs along with the artifacts often present in clinical photographs of oral cavity lesions have not yet allowed for similar results. To overcome these inherent limitations, researchers have attempted to employ variables such as risk factors, demographic data, clinical presentation, and molecular markers with or without other technologies, such as fluorescens or exfoliative cytology, in their attempts to improve the performance of an AI application with some marginal gains.

Unfortunately, the heterogeneity of the studies conducted so far aiming to diagnose oral cancer or OPMDs, the diverse and often inappropriate use of terms of the specific AI technologies employed, and the small sample sizes remain problematic. So far, researchers have not identified a simple enough AI application (e.g., a smartphone app) that could alter our current clinical practices as they relate to oral cancer and mucosal lesion screening or management. What is very promising is the strong interest coupled with the understanding of the need for such developments. Advances can be made in collaboration with scientist/researchers from the fields of computer/engineering to

overcome the identified research limitations that this disease is still facing.

DISCLOSURE

None.

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