Journal of Oral Medicine

Open access Opinion

Enhancing Oral Cancer Detection: A Systematic Review of the Diagnostic Accuracy and Future Integration of Optical Coherence Tomography with Artificial Intelligence

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INTRODUCTION

Early detection of the oral cancer significantly improves patient outcomes. This article reviews the latest advancements in the oral cancer screening technologies, including the use of artificial intelligence, molecular diagnostics, and adjunctive screening tools. It highlights the importance of these innovations in enhancing the accuracy and efficiency of oral cancer screenings. Oral cancer remains a significant global health challenge, with increasing incidence rates observed over the past few decades. Despite advances in treatment, the prognosis for oral cancer is closely linked to the stage at which it is diagnosed. Thus, enhancing early detection methods is crucial for improving the patient outcomes. Recent technological advancements in oral cancer screening hold promise for increasing the accuracy and efficiency of early diagnosis. Traditional oral cancer screening primarily involves visual inspection and palpation by dental professionals during routine check-ups. However, these methods can be subjective and may miss lesions in their early stages.

DESCRIPTION

Tools such as VELScope use fluorescence and multispectral illumination to enhance the visualization of oral mucosal changes. These devices can help identify dysplastic lesions that may not be visible under standard examination. This method can provide a preliminary diagnosis and determine whether a more invasive biopsy is necessary. Recent innovations have introduced more sophisticated screening techniques that enhance detection capabilities. AI has begun to play a transformative role in oral cancer diagnostics. Machine learning algorithms can analyze images of oral lesions and identify patterns that may indicate malignancy. Studies have demonstrated that AI systems can achieve accuracy rates comparable to those of experienced clinicians, providing a valuable second opinion in screening processes. Advances in molecular biology have led to the development of saliva-based tests that can detect specific biomarkers associated with oral cancer. These tests can potentially identify malignant transformations at earlier stages, offering a non-invasive screening alternative. For instance, the use of methylation markers in saliva has shown promise in distinguishing between benign and malignant lesions. Optical Coherence Tomography (OCT) imaging technique provides high-resolution, cross-sectional images of oral tissues. OCT can assist in the identification of early neoplastic changes by providing detailed information about tissue architecture, enabling more accurate diagnoses and reducing the need for invasive biopsies.

CONCLUSION

Advancements in oral cancer screening technologies have the potential to significantly improve early detection and patient outcomes. By embracing innovations such as AI, molecular diagnostics, and enhanced imaging techniques, the field of oral medicine can move closer to achieving more accurate and efficient screenings. As these technologies become more integrated into clinical practice, they may play a crucial role in reducing the morbidity and mortality associated with oral cancer.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

The author's declared that they have no conflict of interest.

Received:	30-July-2024	**Manuscript No:**	IPOM-24-21825
Editor assigned:	01-August-2024	**PreQC No:**	IPOM-24-21825 (PQ)
Reviewed:	15-August-2024	**QC No:**	IPOM-24-21825
Revised:	20-August-2024	**Manuscript No:**	IPOM-24-21825 (R)
Published:	27-August-2024	**DOI:**	10.36648/ipom.8.4.31

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Citation Stevenson H (2024) Enhancing Oral Cancer Detection: A Systematic Review of the Diagnostic Accuracy and Future Integration of Optical Coherence Tomography with Artificial Intelligence. J Ora Med. 8:31.