

Artificial intelligence (A.I.), and Oral Cancer: An appraisal

LOUIS ZALMAN GICK TOUYZ*

School of Dental Medicine and Related Sciences McGill University, Montreal, P.Q, Canada.

Abstract

The definitive diagnosis of oral neoplastic lesions, remains a histopathological examination from biopsy. Oral cancer treatment involves diagnosis, surgical excision, probable radiation therapy and post -op monitoring, all of which can be facilitated, affirmed and expedited by using A.I., as an adjunct to clinical acumen and management. Application of A.I. should/can/must be included in all training g of dental health care workers.



Article History

Received: 20 November 2025

Accepted: 17 December 2025

Keywords

Artificial-Intelligence;
Cancer; Oral-Medicine.

Abbreviations

A.I.	Artificial Intelligence
ART	Adaptive Radio Therapy
(ePRO)	Patient Reported Outcomes
MHCW	Medical Health Care Workers
DHCW	Dental Health Care Workers
OAR	Organs At Risk
WSI	Whole Slide Imagery

Introduction

Screening for Oral Cancer detection has devolved onto qualified dentists, and dental health care workers (DHCW's) who will routinely perform a visual examination of the teeth and soft tissues, whenever a patient presents for dental or gingival complaints.¹⁻² There are some immediate tests to indicate whether any lesion may be pre-malignant, like staining with dyes, a brush biopsy, a collection of exfoliated cells

from saliva, or even detecting neoplastic molecules using unconventional methods.³⁻⁶ But the definitive diagnosis of a suspect observation, remains a partial or total biopsy for histopathological examination.⁷ For confirmed neoplasias, therapy often involves surgical excision, and/or followed by radiation, chemotherapy and prosthetic replacement.^{8,9} Articles using A.I. strategies for Oral cancer have recently emerged in the serious medical literature.¹⁰⁻¹²

CONTACT Louis Zalman Gick Touyz ✉ touyzlouis@gmail.com 📍 School of Dental Medicine and Related Sciences McGill University, Montreal, P.Q, Canada.



© 2025 The Author(s). Published by Enviro Research Publishers.

This is an  Open Access article licensed under a Creative Commons license: Attribution 4.0 International (CC-BY).

Doi: <http://dx.doi.org/10.12944/EDJ.07.0102.06>

Aim

This article indicates directives and data with the use of A.I principles in detecting, and curing oral neoplasias.

Discussion

Clinically A.I. is to be used as a supportive aid and resource for a definitive diagnosis, as A.I. it is not a diagnosis per se. Suspicious odd red and/or white lesions require a clinical visual and possibly a tactile examination. For oropharyngeal cancers, a tissue biopsy is essential to establish a cancer diagnosis before any therapy is instituted.¹³

Clinical approaches can use A.I. for accelerating a systematic oral exam, chairside imaging an extended tele-triage, telemedical multimodal imaging, like smartphone use, or patient operated oral endoscope. A.I. can also be called upon for diagnostic histopathology support using diagnostic digital pathology with Whole Slide imagery (WSI)), and applied as a affirming second reader.^{14,15} All A.I. output has to be scrutinized by a qualified health care professional, before being used for therapeutic decisions that impact patient care, especially with regard to radiotherapy. The area of the lesion is outlined on images and mapped out using endoscopy as the target area for radiation therapy.¹⁶

Clinical treatment planning embraces identifying from detailed histories, which patients may be predisposed to developing cancer. Among these are tobacco and alcohol consumption known as synergistic carcinogens, immune suppression and oral sexual-contact practices. Permission from the patient should be acquired to use A.I. Imaging. The use of A.I. image procurement will help determine if referral is needed, for advanced treatment. The latter always needs taking a biopsy for definitive diagnosis. Should there be uncertainty about suspicious lesions, recall and monitoring a after a month, using comparative A.I images and clinical judgement can determine if there is aggravation of the suspicious lesions, and whether referral should be immediate for full advanced therapy.^{13,14}

When dealing with patient derived images and medical confidential information that is obtained, are all recorded as electronic data, and voluntary permission must be obtained from the patient for

its use in helping to arrive at a final diagnosis and treatment plan. Often the intra-oral lesion will not include recognizable facial features, and voluntary agreement is facilitated. In routine dental practice Medical Histories often don't include questions on personal habits. These can be added by an astute clinician, and using standard radiographs and photography, principals and operator staff can be combined with A.I tele-dentistry to detect suspicious lesions. All mucosae should be photographed; namely the attached gingiva, cheek alveolar mucosae, floor of mouth, lingual L&R lateral, dorsal and ventral views, the hard and soft palates, and the L&R fauces.

With regard to A.I. deployment for specific cancers in oncology, Artificial Intelligence (A.I.) as a ubiquitous discovery resource, is profoundly changing the practice of medicine in general and oncology in particular. As the most recent discipline to emerge in medical practice, all cancer-care centers, medical health care workers (MHCW), practicing clinicians are progressively using a panoply of A.I. therapies, applications and strategies to successfully change their policies, practice, personalized therapies and prolong health in patient lives. A.I. can and will impact the detection and treatment of Oral cancers. Visual differential diagnosis can be provided by A.I. Whole slide images (WSI) must be used and A.I. can identify suspicious areas on histological slides. A skilled trained DHCW should scrutinize the A.I. identified areas for confirmation. Mild, moderate or severe dysplasia should not be automatically signed out by A.I. but by a trained DHCW. Odd visual, pictorial or microscopic presentations may be alerted by A.I. once other demonstrable differences are established.¹⁶⁻²³

The regular use of A.I. direct in the clinic and by consulting remote specialists with tele-dentistry, will reduce the cost of running Clinics, by accelerating exam-to-cure flows, reducing specialists on staff, by exploiting immediate A.I. diagnostic guiding advantages, and sustain or increase the quality of professional oral medicine services.

Radiation therapy demand recognizing organs at risk. (OAR). Adjunctive radiotherapy embraces staging primary tumor and nodal volumes, locations and OARs. A.I. can be used to constrain, record and warn

of approaching or exceeding recommended doses of radiation. A professional task group of technicians could use adaptive radiotherapy. (ART) to optimize post surgical outcomes.^{18,19,20} A Radiation Planning Assistant (RPA) A.I. protocol can be called upon to propose an automated plan to be followed by clinician checks. This well-established, evidence-base tested treatment plan accelerates workflow, and facilitates radiotherapy conventions for head and neck oncology, and is easily adapted and applied to oral cancer.²⁴

Training as a specialty in Oral Medicine has comprehensively included oncology, but only recently has been compelled to include A.I. The major constraining factor confounding progress is the initial outlay and cost of introducing clinical monitors (intra-oral devices for patients, intra-oral cameras for clinical examinations, macroscopic screens, and internet computer connections), for displays, conference discussion and patient education.

For monitoring after therapy, A.I. may be used for electronic Patient Reported Outcomes: (ePRO).A.I will spot an individual at high risk for severe post-radiation induced oral mucositis, and this becomes important as it indicates supportive care should be introduced early. Monitoring the track record and knowing the risk of developing post treatment mucositis will indicate recalibrating thresholds. A closer more frequent nursing follow-up with proactive pain management (systemic pharmaceutical analgesia, and local topical collutoria), with diet modification, will be indicated from A.I. predictions.²⁴

Existing protocols exist for oral cancer management and A.I will assist MHCW's and DHCW's enormously in planning and executing Treatment Plans. A.I. will facilitate diagnosis, compliance with evidence-based protocols for optimal results, maximize benefits derived and expedite the whole process. Even though patients sign permission or treatment forms it is advisable to describe what therapy is being planned,

and explain expected outcomes, before executing procedures. Relying on these accepted and enshrined A.I. Guide-Lines ensures any medico-legal claims for malpractice will be diluted, if not prevented and absolved. Ethical challenges to clinical decisions involving palliative care will be strengthened when guided by evidence based A.I. guiding principles.

Although burgeoning costs to access, implement and apply A.I. support protocols remain a major challenge, with success and repetition, perfection and expediting of techniques, the fee-for-service will moderate and be drastically reduced.

Clinical skill involving all A.I. for all MHCWs and DHCWs will streamline oral cancer therapy. and with repetition of use will reduce costs to institutions and patients alike.

Conclusion

The conclusive diagnosis of a suspect neoplastic lesion, remains a histopathological examination derived from a partial or total excision biopsy. Principles of application of A.I. strategy should be included in all undergraduate and post-graduate training of all health care workers for future improvement of care and reduction of costs.

Acknowledgement

We would like to sincerely thank McGill University for their valuable support and cooperation. Their guidance, resources, and encouragement played an important role in the successful completion of this work. We are truly grateful for their assistance and support.

Funding Sources

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The authors do not have any conflict of interest.

References

1. Speight, P. M., Epstein, J., Kujan, O., *et al* Screening for oral cancer—a perspective from the Global Oral Cancer Forum. *Oral surgery, oral medicine, oral pathology and oral radiology*,. 2017.123(6), 680-687.
2. American Cancer Society. Tests for Oral Cavity and Oropharyngeal Cancers. Updated; March 23, 2021.

3. Bisht, S. R., Mishra, P., Yadav, D., *et al.* (2021). Current and emerging techniques for oral cancer screening and diagnosis: a review. *Progress in Biomedical Engineering*, 3(4), 042003. Screening for oral cancer. *Journal of Experimental Therapeutics and Oncology*. 2021.11, 303-307.
4. Baykul T., Yilmaz, H. H., Aydin, Ü., *et al.* Early diagnosis of oral cancer. *Journal of International Medical Research*, 2010.38(3), 737-749.
5. Chakraborty D., Natarajan C., & Mukherjee A. Advances in oral cancer detection. *Advances in clinical chemistry*, 2019; 91, 181-200.
6. Touyz L.Z.G. (2023) An Oncolfaction Molecule? Canine Olfaction for Oncology Screening and Diagnosis? *EC Neurology*. 2023. 15.2: 03-06.
7. Yang G., Wei L., Thong B.K.S., *et al.* Review of Oral Biopsies, Sample Types, and Detection Techniques Applied in Relation to Oral Cancer Detection. *BioTech (Basel)*. 2022 Mar 2;11(1):5. doi: 10.3390/biotech11010005. PMID: 35822813; PMCID: PMC9245907
8. Sana H., Piogele M. The role of surgery in global cancer services. *The Lancet*, (2024) Volume 403, Issue 10433, 1237 – 1238.
9. Debela D.T., Muzazu S.G., Heraro K.D., *et al.* New approaches and procedures for cancer treatment: Current perspectives. *Sage Open Medicine*. 2021 ;9. doi:10.1177/20503121211034366
10. Vinay V., Jodalli P., Chavan M.S., *et al.* Artificial Intelligence in Oral Cancer: A Comprehensive Scoping Review of Diagnostic and Prognostic Applications. *Diagnostics (Basel)*. 2025 Jan 24;15(3):280. doi: 10.3390/diagnostics15030280. PMID: 4011111
11. Suga, T., Tu, T., Harada, H. *et al.* An AI blind spot for detecting oral cancer. *Br Dent J*. 2025. 239, 86 <https://doi.org/10.1038/s41415-025-9022-7>.
12. Mouttougichenin S., Gunaseelan R., Arthi B., *et al.* Artificial Intelligence in the Screening of Oral Cancer: A Cross-Sectional Study on a Novel App-Based Approach for Primary Health Care Settings. *Journal of Indian Academy of Oral Medicine & Radiology*. 2025 Apr/Jun. 37(2):p 215-220, | DOI: 10.4103/jiaomr.jiaomr_49_25.
13. U.S. Preventive Services Task force. (USPSTF) Recommendations: Oral Cancer-Screening. Nov 15, 2023.
14. Mitbander R., Brenes D., Coole J.B., *et al.* Development and evaluation of an automated Multimodal Mobile detection of Oral Cancer Imaging system to Aid Risk-based Management of Oral Mucosal Lesions. *Cancer Prevention Research , Philadelphia*, . 2025; 18(4) 197-207. Doi: 10.1158/1940-6207. CAPR-24-0253. Cancer.
15. Li L., Pu C., Tao J., Zhu L. *et al.* Development of an oral cancer detection system through deep learning.. *BMC Oral Health*. (2024) 24:1468 <https://doi.org/10.1186/s12903-024-05195-5> RESEARCH
16. NICE: National Institute for health Care and excellence. Artificial Intelligence (AI) technologies to aid contouring for radiotherapy treatment planning: early value assessment (THE 11) P Sept 27, 2013.
17. Touyz L Z.G. Alternative and orthodox medicine and the “ODD” principle. *Current Oncology*. 2012 Apr;19(2):64.
18. Dlamini, Z., Francies, F. Z., Hull, R., *et al.* Artificial intelligence (AI) and big data in cancer and precision oncology. *Computational and structural biotechnology journal*, 2020. 18, 2300-2311.
19. Cellina M., Cè M., Khenkina N., Sinichich P., *et al.* Artificial intelligence in the era of precision oncological imaging. *Technology in Cancer Research & Treatment*, 2022. 21, 15330338221141793.
20. Bhalla S., Laganà A. Artificial intelligence for precision oncology. *Computational methods for precision oncology*, 2022; 249-268.
21. Srivastava, R. Applications of artificial intelligence multiomics in precision oncology. *Journal of cancer research and clinical oncology*. 2023. 149(1), 503-510.
22. Doughaim A.L.M., Al-Suhebany N., Al-Zahrani, M., *et al.* Cancer biomarkers and precision oncology: A review of recent trends and innovations. *Clinical Medicine Insights: Oncology*, 2024. 18, 11795549241298541.

23. Spanyol, A. in Precision Oncology. AI in Precision Oncology, (2024). 1(6); 316-317.
24. Court L.E., Cardenas C.<e.< Schubert L.K. *et al.* Radiation Planning Assistant- A streamlines Fully Automated Radiotherapy Treatment Planning System. *Journal of Visualized Experiments.* (JoVE). 2028. Doi:10. 3791/57411.
25. Srivastava, R. Advancing precision oncology with AI-powered genomic analysis. *Frontiers in Pharmacology*, 2025. 16, 1591696.