Post-Radiation Dental Monitoring with Intraoral Scanner as an Emerging Clinical and Research Tool: Proof of Concept

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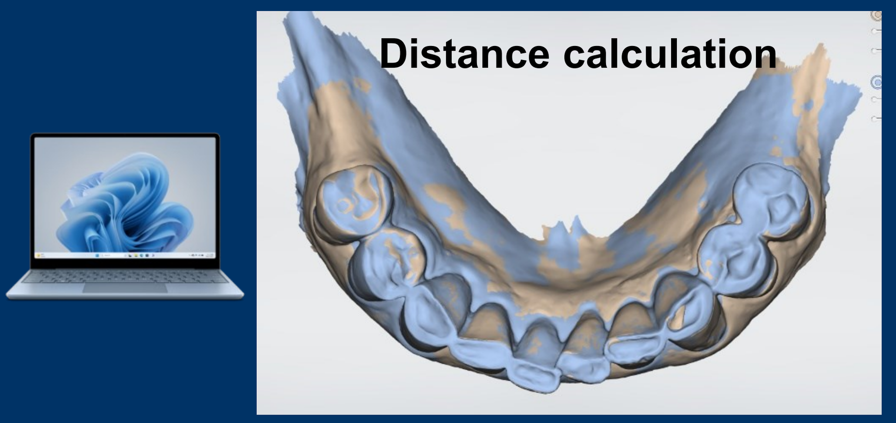
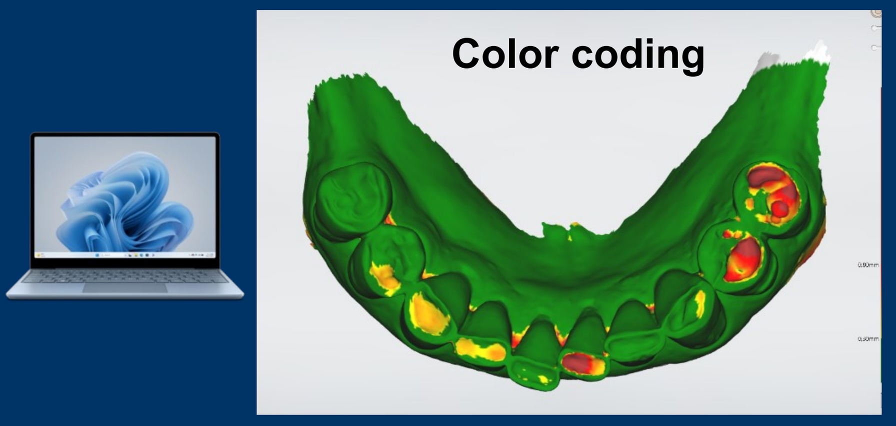
WORKFLOW





INTRODUCTION

Dental monitoring for post-radiation dental care is crucial for patients who underwent head and neck radiation therapy (HNCRT). Intraoral scanners (IOS) offer high-resolution imaging and non-invasive data acquisition, making them promising tools for this purpose. This abstract explores the proof of concept of using IOS for both clinical and research purposes in post-radiation dental monitoring.

METHODS AND MATERIALS

A case-series evaluation assessed the feasibility and effectiveness of IOS for post-radiation dental monitoring. Patients receiving regular dental care after HNCRT underwent dental examinations using IOS.

Sequential intraoral scans were registered using stable landmarks for accurate comparison (Workflow & Fig 1). Difference evaluation, including quantitative analysis with surface distance calculation and color-coded visualization, was performed (Fig 2).

Figure 1. Intraoral scans of HNC patient, treated with radiotherapy, (a) basline and (b) follow-up scan of mandible. Subtle changes are difficult to identify with visual evaluation.

RESULTS

The detection thresholds were 0.3mm for the entire dental arch and 0.1mm for individual teeth, allowed for the precise detection, visualization, and quantitative assessment of caries, abrasion (Fig. 2), recession (Fig. 3), and plaque (Fig.4). Measurements will facilitate scientific evaluation, while the use of pseudocolor for 3D visualization assisted in clinical diagnosis, patient encouragement, and insights into the prevalence and progression, thereby guiding treatment decisions and enriching patient care. Patients expressed high satisfaction with the non-intrusive nature and comfort of IOS examinations.

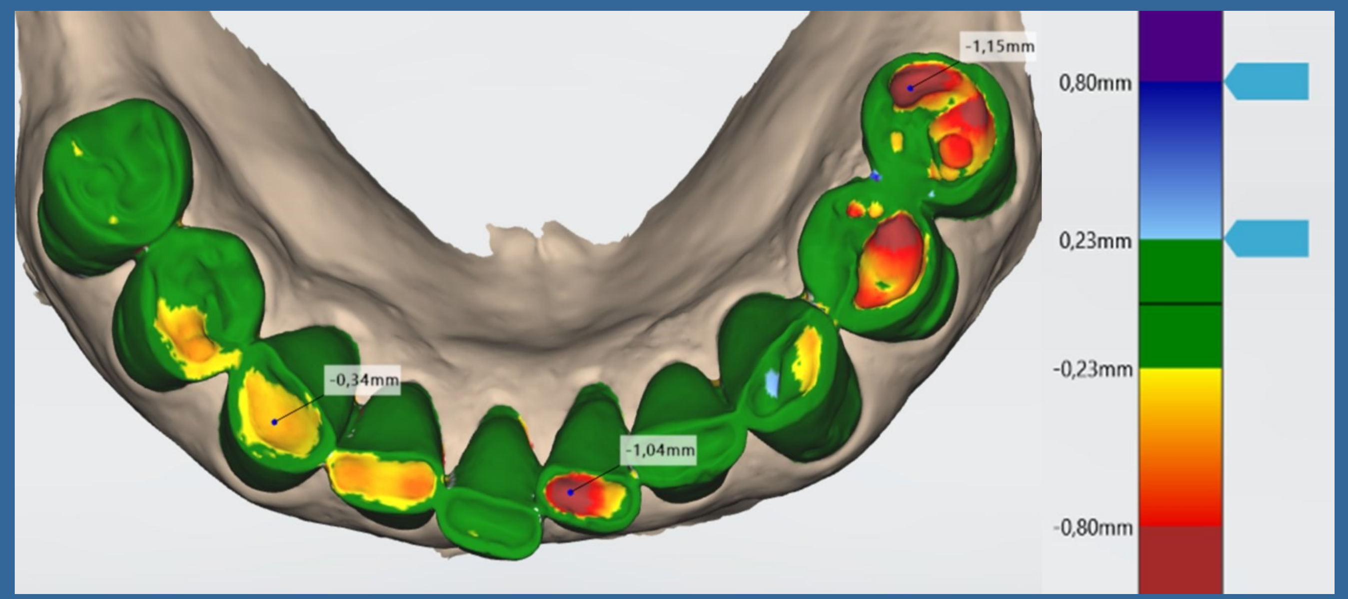


Figure 2. Color coded 3D model , obtained from IOSs form Fig 1. Progression of tooth abrasion in incisal and occlusal surfaces mandibular teeth in 6 months. Measurements can be performed at any point of 3D model..

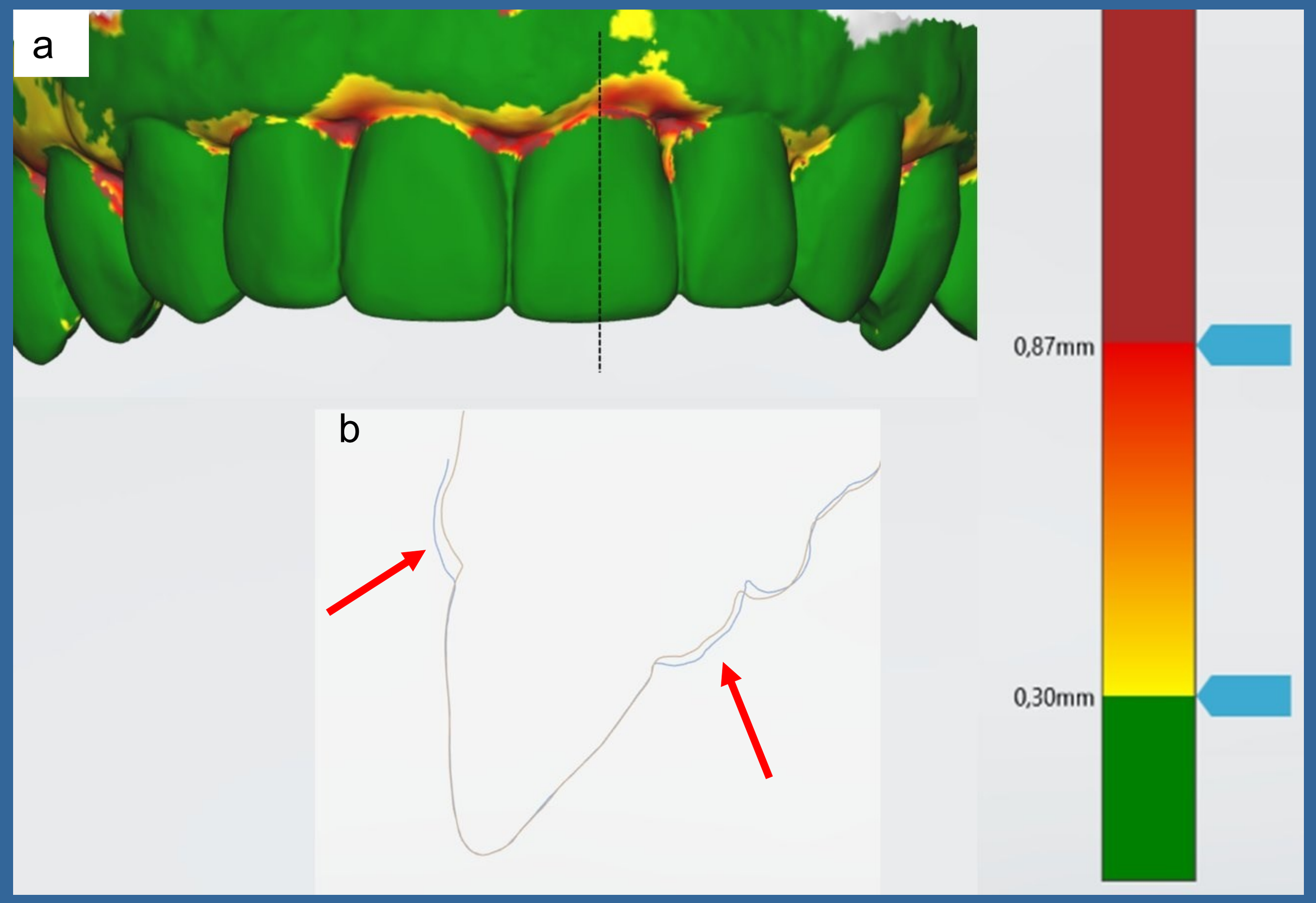


Figure 3. Progression of gingival recession around maxillary anteriors during 14 months, evident in (a) color coded 3D model with black line, indicating the position of (b) cross-section at tooth 21. Arrows → inidcate gingival changes at buccal and palatal side.

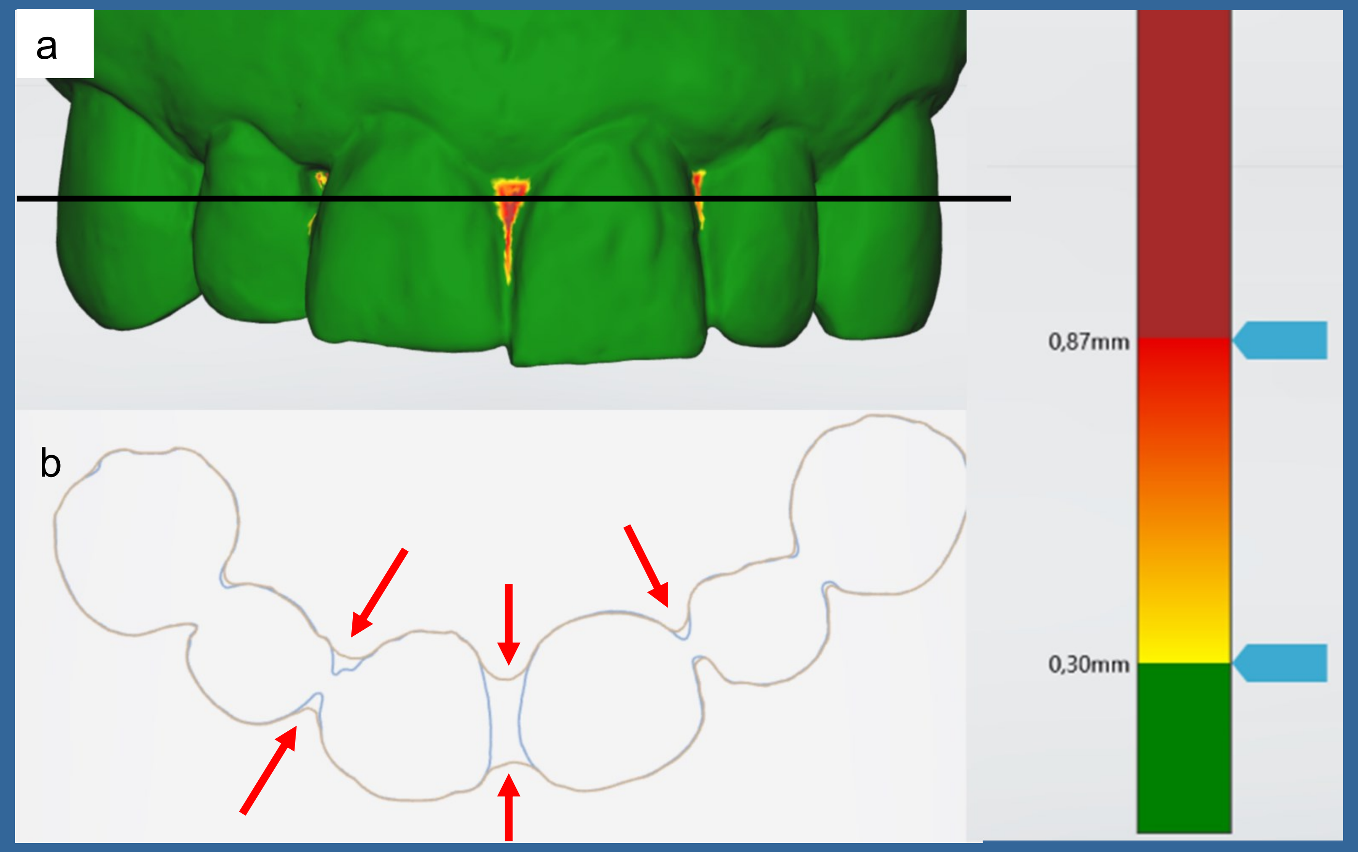


Figure 4. Evaluation of plaque thickness, obtained with scanning before and after prophylactic treatment at same visit. The plaque thickness in interdental areas of maxillary anteriors is evident in (a) color coded 3D model with black line, indicating the position of (b) cross-section image. Arrows → inidcate plaque in interdental spaces from buccal and palatal side.

CONCLUSIONS

The findings suggest that IOS hold immense potential as an emerging clinical and research tool for post-radiation dental monitoring. Their noninvasiveness, high-resolution, and speed make them valuable additions to conventional methods. Further research is warranted to validate these preliminary findings and establish standardized protocols for integrating IOS into post-radiation dental care.

REFERENCES

Kuralt M, Fidler A. Assessment of reference areas for superimposition of serial 3D models of patients with advanced periodontitis for volumetric soft tissue evaluation. J Clin Periodontol. 2021 Jun;48(6):765-773.

Kuralt M, Fidler A. A novel computer-aided method for direct measurements and visualization of gingival margin changes. J Clin Periodontol. 2022 Feb;49(2):153-163.

Gupta S, Kumar A. Role of intraoral scanners in dental practice: a comprehensive overview. J Oral Biol Craniofac Res. 2023;13(2):168-175.

Lee J, Park C. Advantages and limitations of intraoral scanners: a literature review. Restor Dent Endod. 2022;47(1):e5.

Patel S, Brown J. Intraoral scanners: a review of technology, clinical applications, and future developments. Quintessence Int. 2021;52(2):96-110.

Wang P, Sung E. Emerging trends in dental imaging: a review. J Dent Res. 2019;98(7):741-749.

Smith A, Jones B. Oral complications of radiotherapy. Lancet Oncol. 2020;21(5):e228-e238.

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