ACCURACY OF ARTIFICIAL INTELLIGENCE IN ASSESSING ROOT RESORPTION STAGE IN PRIMARY TEETH

Elif Kardes, DDS,MSD, Madhu Mohan, DMD

Rutgers School of Dental Medicine, Department of Pediatric Dentistry

RUTGERS UNIVERSITY

Introduction

Accurate assessment of root resorption in primary teeth is critical for diagnosis, treatment planning, and longitudinal monitoring in pediatric dentistry.[1]

Physiologic root resorption is a dynamic process that varies by tooth type and stage of development, and its interpretation on radiographic imaging can be subjective and dependent on clinician experience.[2]

Misinterpretation may lead to inappropriate treatment decisions, including premature extraction or delayed intervention.[3]

Artificial intelligence (AI) has recently emerged as a promising tool in dental image analysis, demonstrating utility in detecting caries, periodontal bone loss, and periapical pathology.[4]

However, despite advancements in AI-based dental diagnostics, a clinically validated framework for identifying root resorption stages in primary teeth and translating those findings into treatment decisions has not yet been established.[5]

The application of AI for evaluating physiologic root resorption remains limited, particularly in pediatric populations.[6]

Aim

The purpose of this study is to evaluate the accuracy of an artificial intelligence (AI) dental imaging platform in identifying root resorption stages in primary teeth using de-identified radiographic images, and to compare its performance with assessments made by experienced pediatric dentists.

Materials and Methods

Our study utilizes de-identified radiographic images obtained from routine pediatric dental care. Bitewing and periapical radiographs demonstrating primary or mixed dentition are included based on predefined inclusion criteria, including adequate image quality and clear visualization of primary tooth roots.

Eligible images are independently evaluated by multiple experienced pediatric dentists, who assign root resorption stages based on established clinical criteria. These clinician assessments serve as the reference standard. To ensure consistency, calibration sessions are conducted prior to evaluation.

The same set of de-identified images is analyzed using a commercially available dental AI platform. AI-generated assessments of root resorption stages are recorded and compared to clinician-determined stages.

Statistical analysis includes descriptive statistics and inter-rater agreement measures. Agreement between AI and clinician assessments is evaluated using kappa statistics and percentage agreement. Additional subgroup analyses are performed based on tooth type and stage of physiologic resorption.

All data are de-identified and stored on a secure, password-protected institutional server. This study was conducted in accordance with institutional review board (IRB) approval.

Results

Data analysis are currently ongoing. The primary outcome measure will be the level of agreement between AI-generated and clinician-determined root resorption stages across different primary tooth types and stages of physiologic resorption.

Secondary analyses will evaluate patterns of concordance and discordance to further characterize AI performance, including potential variations based on resorption severity and tooth morphology.

References

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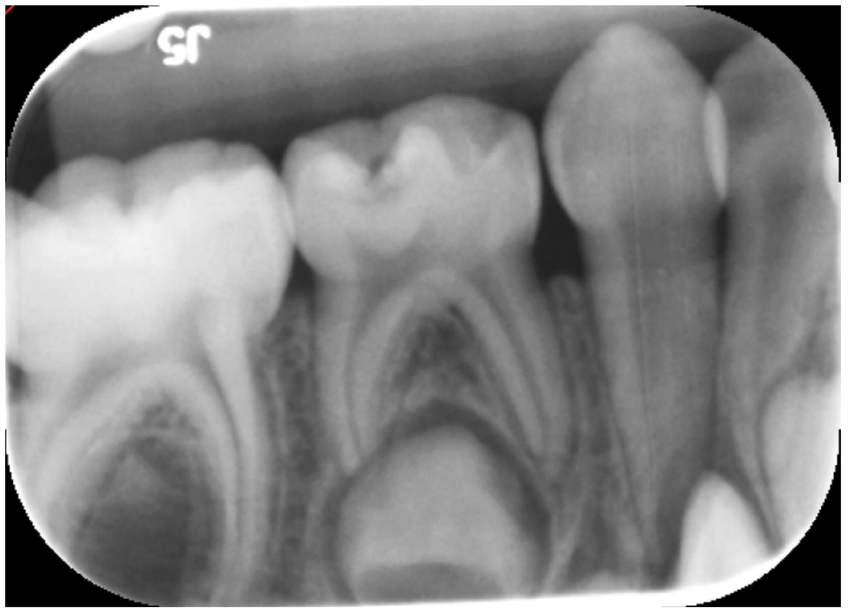
Data



Study ID	Tooth # / Region	Type of Radiograph	Root Resorption Stage (Clinician 1)	Root Resorption Stage (Clinician 2)	Root Resorption Stage (Clinician 3)	AI-Detected Root Resorption Stage	Consensus Among Clinicians (Y/N)	Clinician–AI Agreement (Y/N)	Notes / Comments

Discussion and Conclusion

This study explores the feasibility of applying AI to a clinically nuanced aspect of pediatric dentistry: the assessment of physiologic root resorption in primary teeth. Given the subjective nature of radiographic interpretation, variability among clinicians is expected, and AI may offer a more standardized and reproducible approach.

It is anticipated that agreement between AI and clinician assessments may vary depending on the stage of resorption, with earlier or more subtle changes presenting greater diagnostic challenges. Identifying patterns of disagreement will be critical in understanding the limitations of current AI models and guiding future refinement.

The integration of AI into pediatric dental diagnostics has the potential to enhance clinical decision-making, particularly in settings where access to experienced clinicians may be limited. However, careful validation against expert reference standards is essential before clinical implementation.