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COMPARISON OF PHOTOTHERMAL RADIOMETRY AND MODULATED LUMINESCENCE, INTRAORAL RADIOGRAPHY, AND CONE BEAM COMPUTED TOMOGRAPHY FOR DETECTION OF NATURAL CARIES UNDER RESTORATIONS.

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Background: Intraoral radiographs (IR) are commonly used to evaluate for caries but require approximately 30% to 40% mineral loss before detection, thereby necessitating techniques with a high sensitivity index for early detection. Photothermal radiometry and modulated luminescence (PTR/LUM) offers a potentially more sensitive and safe method for detecting recurrent caries; however, there are no published studies comparing its use in detection of recurrent caries under composite restorations relative to IR and cone beam computed tomography (CBCT).

Objective(s): The aim of this in vitro study was to compare the sensitivity, specificity, and receiver operating characteristic area under the curve (ROC AUC) of a caries diagnostic system based on PTR/LUM to digital IR and CBCT in detecting simulated recurrent decay under restorations.

Study Design: The study used 54 teeth with Class II composite restorations on 70 proximal surfaces; 35 had caries lesions remaining, and 35 were sound. The gingival floor of the restored surfaces was assessed for presence or absence of caries under composite restorations using each of the 3 modalities. Statistical calculations and analysis were performed using the R statistical computing environment. Sensitivity and specificity were calculated for each device, for each rater and image combination, and ROC analysis was performed.

Results: Average sensitivity across the 6 experienced dentists was 0.40 for both IR and CBCT. However, the sensitivity for the PTR/LUM was 0.89. Specificity of PTR/LUM and IR was 0.80, whereas the CBCT method was 0.70. The intrarater agreement varied for different observers with the use of IR and CBCT, ranging between moderate and substantial with only 1 observer having poor intrarater agreement for both methods. PTR/LUM showed only moderate agreement.

Discussion/Conclusions: PTR/LUM, which involves nonionizing radiation, can serve as a sensitive adjunct in early caries detection and monitoring.

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DOSIMETRY AND DIAGNOSTIC ACCURACY OF INTRAORAL AND EXTRAORAL BITEWINGS IN DETECTING APPROXIMAL CARIES.

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Background: Traditionally, interproximal caries has been diagnosed radiographically by intraoral bitewing radiographs. Although this has been the conventional practice, the challenge of accommodating the film/ image receptor in the mouth, especially in patients with a gag reflex, has affected image acquisition and quality. A new method of acquiring bitewings with an extraoral approach has been recently introduced but the quality and diagnostic efficacy along with the radiation dosage of these techniques have not been well studied.

Objective(s): The aim of this study was to evaluate the diagnostic accuracy of intraoral and extraoral bitewings (IOBs and EOBs) in their ability to detect proximal caries and to compare the effective doses from both techniques.

Study Design: Human teeth with or without proximal caries were used in this study. Carious lesions were created with different degrees of decalcification on 60 teeth (120 surfaces). These teeth were then placed into sockets of dry human skulls. Intraoral bitewings were acquired using a Kavo LM/CM109 wall-mounted X-ray tube with exposure parameters of 70 KVp, 7 mA, and 0.125 second. Extraoral bitewings were acquired with a Planmeca Promax at 74 kVp,7 mA, and 7.5 seconds. Two radiologists and a general dentist scored the radiographs using standardized software (MiPACS) and display monitors. Dose measurements were done on an anthropometric RANDO phantom. OSLdot dosimeters were used at 24 sites for radiation dose measurements. Fifteen exposures were performed for each dosimeter, and absorbed dose was calculated as an average of the15 exposures using the International Commission on Radiological Protection (ICRP, 2007) tissue weighting factors.

Results: For the diagnosis of interproximal caries, extraoral bitewings showed a sensitivity of 92.3% and specificity of 93.4%, whereas intraoral bitewings showed sensitivity of