

Comparison of photothermal radiometry and modulated luminescence, intraoral radiography, and cone beam computed tomography for detection of natural caries under restorations

Adeyinka F. Dayo, Bennett T. Amaechi, Marcel Noujeim, S. Thomas Deahl, Peter Gakunga, Rujuta Katkar
In Press, Journal Pre-proof, Available online 16 September 2019

Abstract

Objectives

The aim of this *ex-vivo* study was to measure the sensitivity, specificity, and receiver operating characteristic (ROC) area under the curve (AUC) of a caries diagnostic system based on photothermal radiometry and modulated luminescence (PTR/LUM) and compare them to the values for digital intraoral radiography (IR) and cone beam computed tomography (CBCT) in detecting recurrent decay.

Study design

Class 2 composite restorations were prepared on 70 proximal surfaces: 35 with caries and 35 without caries. The gingival floor of the restored surfaces was assessed for caries under the restorations using each of the three modalities. Statistical calculations and analysis were performed using the R statistical computing environment.

Results

The average scores for sensitivity among the 6 observers were 0.89 for PTR/LUM, 0.38 for IR, and 0.40 for CBCT. Sensitivity for PTR/LUM was statistically greater than sensitivity for IR and CBCT. Average scores for specificity were 0.83, 0.80, and 0.70 for PTR/LUM, IR, and CBCT, respectively. There was no statistical difference in specificity. The AUC was 0.65 for IR and 0.59 for CBCT, which were statistically different. PTR/LUM showed moderate intra-observer agreement.

Conclusion

PTR/LUM, which involves non-ionizing radiation, can serve as a sensitive adjunct in early caries detection and monitoring.

Dayo AF, Amaechi BT, Noujeim M, et al. Comparison of photothermal radiometry and modulated luminescence, intraoral radiography, and cone beam computed tomography for detection of natural caries under restorations. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology 2019.