

### Influence of Examiners' Clinical Experience on the Reproducibility and Validity of Radiographic Examination in Detecting Occlusal Caries

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The aim of this in vitro study was to assess the influence of examiners' clinical experience on the reproducibility and validity of radiographic examination in detecting occlusal caries lesions. Double standardized bitewing radiographs were obtained from 160 permanent molars. Occlusal surfaces were photographed and one occlusal site per tooth was visually chosen. Radiographic examination was performed by last-year dental students from 2 universities (A, n = 5; B, n = 5) and by dentists with 5–7 years' experience working in different countries (C, n = 5; D, n = 5). All examinations were repeated (one-week interval). The teeth were histologically prepared and assessed for caries extension. Unweighted Cohen's Kappa for intra-examiner reproducibilities were: A (0.11–0.40); B (0.12–0.33); C (0.47–0.58); D (0.42–0.71). Inter-examiner reproducibilities (mean unweighted Cohen's Kappa ± SD) were: A (0.07 ± 0.05); B (0.12 ± 0.09); C (0.24 ± 0.08); D (0.33 ± 0.10). Only the difference between Groups A and B was not statistically significant (Student's t test;  $\alpha = 0.05$ ). Sensitivity, specificity and accuracy were calculated at D<sub>3</sub> threshold and compared (McNemar test,  $\alpha = 0.05$ ). Specificity was high (0.92–1.00) for all groups, with no statistically significant difference between the groups of dentists (C and D). Sensitivity was low (0.03–0.13) with a statistically significant difference for group B. Accuracy was similar for all groups (0.55). Spearman correlations were: A, 0.12; B, 0.24; C, 0.30; D, 0.39. In conclusion, the reproducibility of radiographic examination, as well as the validity in detecting dentine occlusal caries, was influenced by the examiners' clinical experience.

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### Performance of Fluorescence Methods, Radiographic Examination and ICDAS II System for Occlusal Caries Detection

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This in vitro study compared the performance of fluorescence-based methods, radiographic examination, and ICDAS II system for occlusal caries detection. Two experienced dentists twice assessed independently 119 molars using laser fluorescence (LF and LFpen) and fluorescence camera (FC) devices, ICDAS II system and bitewing radiographs (BW). After these assessments, the teeth were histologically prepared and assessed for caries extension. Sensitivity, specificity, area under the ROC curve and post-test probability were obtained at D<sub>3</sub> threshold. Cut-off limits

were calculated for the FC device. Intra-class correlation (ICC) were used to assess inter- and intra-examiner reproducibility for LF, LFpen and FC and kappa for ICDAS II and BW. The sensitivities were 0.86 (FC), 0.78 (LFpen), 0.73 (ICDAS II), 0.51 (LF) and 0.34 (BW). The specificities were 0.97 (BW), 0.89 (LF), 0.65 (ICDAS II), 0.63 (FC) and 0.56 (LFpen). The area under the ROC curve varied from 0.72 to 0.83. The inter- and intra-examiner ICC values were respectively 0.90 and 0.85 for LF, 0.93 and 0.87 for LFpen and 0.85 and 0.76 for FC. The ICDAS II kappa values were 0.51 (inter-examiner) and 0.61 (intra-examiner). The BW kappa values were 0.50 (inter-examiner) and 0.62 (intra-examiner). The post-test probability for dentine caries detection was high for BW and LF. It can be concluded that the performance of each method changes according to the sensitivity and specificity. The ICDAS II combined with BW showed the best performance, and this is the best combination to detect caries on occlusal surfaces.

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### Detection of Proximal Caries on Extracted Permanent Teeth: Relationships between ICDAS-II, Laser Fluorescence, Radiographs and Histology

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This study aimed to determine the relationship between ICDAS-II, laser fluorescence (LF; DIAGNOdent), and radiographic readings of approximal surfaces and histological depth of lesions. The sample consisted of 160 carious/sound surfaces on 140 extracted permanent teeth stored in thymol water at Universidad El Bosque. The surfaces were initially scored visually using the ICDAS criteria (scores 0–6). After a few days LF readings were performed. Radiographs were then taken, scanned and examined on the computer screen using a program allowing change of contrast. Re-examinations using the different detection systems were conducted. The teeth were finally sectioned and the involved surfaces classified using a stereomicroscope as: 0, sound; 1, caries restricted to outer half of enamel; 2, caries between inner half of enamel and outer third of dentine; 3, caries in the middle third of dentine; 4, caries in the inner third of dentine. The original LF readings were used, while the radiographs were scored in 5 stages like the histological classification. Spearman correlations were: ICDAS-II versus histology, 0.81 (n = 151); LF versus histology, 0.54 (n = 151); radiographs versus histology, 0.86 (n = 131). Intra-examiner reproducibilities for ICDAS-II and radiographs were both 0.72 (kappa) and that for LF was 0.83 (Spearman correlation). To conclude, ICDAS-II and radiographs are satisfactorily correlated with lesion depth on approximal surfaces. LF is moderately correlated with approximal lesion depth, which might be explained by the fact that the teeth were stored in thymol water and that there were many brown spot lesions in the sample.