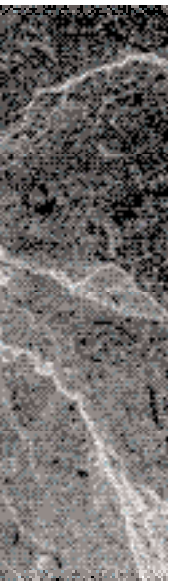

Ask the Experts

CARIES DETECTION WITH LASER FLUORESCENCE

Associate Editor
Edward J. Swift Jr., DMD, MS*

QUESTION: How accurate is laser fluorescence as a method for detecting pit and fissure caries?

ANSWER: The traditional method for diagnosing pit and fissure caries has been visual inspection and probing with a sharp explorer. Not only is this method inaccurate, it also is potentially damaging to demineralized enamel, and might inoculate caries from one tooth to another. Therefore, alternative methods and devices for identifying noncavitated pit and fissure caries are very desirable, and several have been developed.[1] The most popular such device, the DIAGNOdent (KaVo, Lake Zurich, IL, USA), emits pulses of red laser light. Fluorescence—possibly from bacterial by-products in the enamel and dentin—is analyzed and quantified.[1]

Bader and Shugars recently published a systematic review of the literature on the performance of this particular device.[2] All 20 studies of dentinal caries detection reviewed in this article included histologic evaluation of the presence or absence of caries and reported the performance of the DIAGNOdent as sensitivity and specificity values.

Sensitivity and *specificity* are statistical terms used to describe the accuracy of a diagnostic test. *Sensitivity* means the probability that the test will identify a patient (or, in the case of the DIAGNOdent, a tooth surface) with a given disease or condition. *Specificity* refers to the probability of the test having a negative result in the absence of disease. A "perfect" diagnostic test would identify the disease in every subject with the condition, and in no subject without the condition.

The DIAGNOdent appears to have good sensitivity (using the manufacturer's recommended thresholds), as it typically identifies between 7 and 9 of every 10 histologically confirmed dentinal lesions, which is better than the results obtained by visual examination. However, some evidence suggests that sensitivity results might be affected by examiner technique. In addition, it is not clear that all of the lesions detected by the device, and confirmed histologically, constitute active caries (ie, lesions that will progress over time).

Unfortunately, the improved sensitivity comes at the cost of reduced specificity. In other words, there is a greater risk of false positives with the DIAGNOdent than with visual inspection. The obvious clinical implication is the potential for overtreatment, ie, that teeth without dentinal caries would be opened and restored.

Does the risk of false positives make the DIAGNOdent useless as a

*Professor and chair, Department of Operative Dentistry, University of North Carolina, Chapel Hill, NC, USA

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diagnostic tool? The answer is no—if the clinician understands the risk of false positives and the fact that he or she, not the device, must ultimately make the caries diagnosis.

The DIAGNOdent appears to have some clinical value, primarily as a supplement to traditional visual examination on a longitudinal basis. Rather than relying on a single observation of a suspicious surface, the device offers the opportunity to introduce enhanced preventive measures and re-examine the surface periodically to determine if the fluorescence value has changed over time. Although some small amount of variation in scores is possible,[3] a pattern of increasing scores over time would be a strong indication of progression, and then perhaps the need for surgical intervention.

Any adverse outcomes of delaying a surgical intervention when caries is present but not detectable with traditional means (including radiographs) would seem to be relatively minor, based on the results of a recently reported study of "suspicious areas" in which watchful waiting was compared with immediate opening.[4] Not only were fewer than half of the suspicious areas found to have caries extending into the dentin, but among the surfaces that were watched rather than opened, only 16% were deemed to have progressed over the next 2 years. Further, the average volume of the cavity preparations performed after waiting was similar to that of the preparations performed immediately.

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Editor's Note: If you have a question on any aspect of esthetic dentistry, please direct it to the Associate Editor, Dr. Edward J. Swift, Jr. We will forward questions to appropriate experts and print the answers in this regular feature.

Ask the Experts
Dr. Edward J. Swift Jr.
Department of Operative Dentistry
University of North Carolina
CB#7450, Brauer Hall
Chapel Hill, NC 27599-7450
Telephone: 919-966-2770; Fax: 919-966-5660
E-mail: Ed_Swift@dentistry.unc.edu