Laser Fluorescence Detection of Occlusal Caries

Clinical utilization of the KaVo DIAGNOdent
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Detecting Occlusal Caries

Although significant advances (eg, improved oral hygiene, fluoridated water supply) have been made in caries prevention, occlusal pit-and-fissure decay still remains a major concern. Research indicates that, while 80% of caries lesions occur in the occlusal anatomy, a significant percentage of these lesions go virtually undetected using conventional protocols.

Conventional methods of diagnosing dental caries such as manual probing and radiographic evaluation are often ineffective in detecting enamel defects, as they may be too small or inaccessible to the diagnostic tool. Additionally, manual probing has the potential of stimulating caries due to the iatrogenic damage caused by the explorer. Radiographs (eg, bitewing x-rays), although effective in revealing advanced stages of decay, are unsuccessful in detecting early caries, especially in the complex anatomy of fissure areas.

Fortunately, with the advent of the DIAGNOdent as well as the use of traditional protocols, dental clinicians can now successfully detect the presence of occlusal decay and properly treat the tooth structure as necessary.
**Laser Fluorescence for Caries Detection**

The innovative technology of KaVo's DIAGNOdent, a 655 nm diode laser, supports the detection of noncavitated, occlusal pit-and-fissure caries as well as smooth surface caries at the earliest possible stage. Clinical investigations have demonstrated high sensitivity (% correctly diagnosed cariously involved sites) and reproducibility in the diagnosis of pit-and-fissure caries. The measurements from DIAGNOdent, along with conventional diagnostic tools and the clinician's professional judgment, aid dental professionals in determining whether to monitor suspect areas over time and treat with preventative therapy or restore the infected dentin with minimally invasive techniques.

**Function of the DIAGNOdent**

The DIAGNOdent measures laser fluorescence within tooth structure. As the incident laser light is propagated into the site, two-way handpiece optics allows the unit to simultaneously quantify the reflected laser light energy. At the specific wavelength that the DIAGNOdent laser operates, clean healthy tooth structure exhibits little or no fluorescence, resulting in very low scale readings on the display. However, carious tooth structure will exhibit fluorescence, proportionate to the degree of caries, resulting in elevated scale readings on the display of the DIAGNOdent.

An audio signal allows the operator to hear changes in the scale values, enabling focus on the patient and not solely on the device.

Occlusal surfaces deemed free of decay after clinical and radiographic examination.

Upon sectioning, caries is found underneath otherwise intact enamel.
Proven Clinical Results

Best Practices for Implementing the DIAGNOdent

Step 1: Evaluate patient for risk factors
- Previous restorative experience
- Dietary habits
- Oral Hygiene Level

Step 2: Debride pits and fissures
- Air polishing devices are highly efficient means (ie, KaVo PROPHYflex) for efficient removal of organic plugs present inside the occlusal pits and fissures.

Step 3: Scan with DIAGNOdent and observe and record numeric values
- Numeric values correlate to extent of decay.
- Lussi (2000) recommends:
  - Values between 10–15 require no active care or treatment.
  - Values between 15–30 require preventative or operative care, depending on the patient’s caries risk.
  - Values of 30+ require operative and preventative care.
- Apply findings to current treatment recommendations for management of occlusal caries.

Step 4: If indicated, proceed with restorative phase
- Restore using appropriate materials and technique.

CASE 1

Figure 1. Tooth No. 15 shows no signs of caries.

Figure 2. The radiograph did not show any radiolucency on tooth No. 15.

CASE 2

Figure 1. Occlusal view of posterior tooth that appears to be free of caries.

Figure 2. The preoperative radiograph also shows no indication of caries.

CASE 3

Figure 1. Occlusal view shows no signs of carious lesions.

Figure 2. A radiograph of tooth No. 14 shows no visible carious involvement.
Figure 3. The DIAGNOdent demonstrated an elevated reading of 28 in the intact mesial fossa.

Figure 4. The suspect area of tooth No. 15 was excavated with air abrasion (KaVo RONDOflex). Caries was already into dentin.

Figure 5. Definitive restoration shown from occlusal view following conclusion of successful diagnostic and direct resin procedures.

Figure 3. The DIAGNOdent is applied in order to confirm the presence of caries in the seemingly intact posterior tooth.

Figure 4. Carious lesions are removed, and care is taken to preserve sound tooth structure.

Figure 5. Postoperative occlusal view demonstrates the natural form and color of the restored tooth.

Figure 3. Subsequent examination with the DIAGNOdent revealed a peak reading of 31 in both the central and distal fossa.

Figure 4. The final prerestorative photograph shows the extent of the operative preparations.

Figure 5. Postoperative view of the posterior site demonstrates restored tooth.

Courtesy of Angel Sanchez-Figueras, Jr., DDS
Features and Benefits

With DIAGNOdent, everybody wins:

**Patient wins**
- Early caries detection—over 90% accurate
- Promotes minimally invasive treatment
- Provides objective data to increase confidence in treatment decisions
- Interactivity engages patient in examination process
- Safe, no x-ray exposure
- Painless

**Hygienist wins**
- Empowers hygienist to educate patients
- Provides quantifiable data to objectively monitor lesions over time
- Enables placement of sealants with confidence
- Identifies areas of high risk to ensure doctor’s involvement during hygiene appointment

**Dentist wins**
- Over 90% accurate in detecting lesions not detectable with x-rays or explorer
- High patient acceptance, great marketing tool
- Increases confidence in treatment decisions
- Prevents over or under treatment of suspect teeth
- Perfect adjunct for microdentistry such as air abrasion with new KaVo RONDOflex handpiece
- Practice Management Consultants and thousands of U.S. dentists agree that the DIAGNOdent provides the best ROI (return on investment) in dentistry today.

"You need this device!"
Dir. Dr. Gordon Christensen, DIAGNOdent-Scientific Diagnosis of Caries; Practical Clinical Courses, May 2001

Additional Reading