

## CASE EXAMINATION

### CARIES DETECTION DEVICES

# Use of a Caries Detection Aid in the Conservative Direct Treatment of Caries

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**Abstract:** This discussion explores the rationale behind the use of a caries detection aid, the materials currently available, and a case presentation where a caries detection device is used in the treatment of caries in a teenage patient. Although caries detection may not be used in the treatment of every decayed tooth, it can be very effective in making sure all caries are removed, as well as allowing for conservative treatment of teeth.

When it comes to problems in the mouth, clinicians know the importance of catching them early before they get out of hand. Finding problems earlier rather than later not only keeps patients happy and healthy, it saves everyone time and money. The use of digital caries detection technology in today's dental practice is very important for maintaining patient-centered care. Using a caries detection aid allows dentists to practice minimally invasive dentistry. Before a decision is made to cut into a tooth, risk assessment-based early diagnosis and treatment of underlying disease can be applied. In the United States, dental caries in children and adults has been declining for the past 40 years. At this time, however, oral disease continues to be prevalent and presents a major public health issue. As with any disease, early detection is the key to reversing this trend.

### Why Use Caries Detection Aids?

There are a variety of opinions and approaches when it comes to using or not using caries detection aids. Clinicians or groups will typically decide in which direction to take their offices. Some clinicians are fully entrenched in the digital world and feel that these devices are the standard of care. Others may deem these devices useful in conjunction with other products in their offices, and a third group may see these devices as unnecessary and costly. While our goal as clinicians is to restore and heal the dentition, we must also do our best to prevent caries growth or arrest it at its onset.

The advent of minimally invasive dentistry has made caries detection aids extremely valuable in the armamentarium of today's

clinician. Dentists or, depending on state laws, dental auxiliaries can use these devices, along with magnification and radiographs, for true caries detection<sup>1</sup> during the initial examination or on a recall basis. They can also be used during a procedure to ensure that all decay is removed and to keep a restoration as conservative as possible. Caries detection aids can also be used to help with third-party payment, as the photographs can be far more revealing than dental

radiographs alone. Furthermore, these devices can be used to track problems over time, such as wear or cracks. Lastly, and perhaps most important, is that these devices allow patients to see and understand the problem, allowing them to take ownership and understand the need for treatment or preventative measures.

There are a number of caries-detecting devices on the market. The following is a list of the Food and Drug Administration classifications of the different devices<sup>2</sup>:

- DEXIS CariVu™ (DEXIS, [www.dexis.com](http://www.dexis.com)), DIAGNOdent (KaVo Dental, [www.kavousa.com](http://www.kavousa.com)), and Microlux™ Transilluminator (Ad Dent Inc., [www.addent.com](http://www.addent.com)) are in the Caries Detector, Laser Light, and Transmission category.
- DOE SE (DentLight, [www.dentlight.com](http://www.dentlight.com)) is in the Ultraviolet Detector category.

- SoproLIFE® (ACTEON North America, [www.acteonusa.com](http://www.acteonusa.com)), The Canary System® (Quantum Dental Technologies, [www.thecanarysystem.com](http://www.thecanarysystem.com)), and CamX Spectra (Air Techniques, Inc., [www.airtechniques.com](http://www.airtechniques.com)) are in the Laser Fluorescence Caries Detection category.

The Air Techniques CamX Spectra (Spectra), used in the case presented, is an ergonomic digital imaging instrument designed

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for the detection of caries while being completely noninvasive. The hand-held device is the size and shape of an intraoral camera and detects tooth decay by measuring increased light-induced fluorescence. Spectra is designed to identify cariogenic bacteria in fissures on occlusal surfaces and can also be used during the restorative phase to verify that all caries have been removed. Light-emitting diodes project high-energy, violet-blue light at a wavelength of 405 nm onto the tooth surface. Light of this particular wavelength stimulates porphyrins (special metabolites of cariogenic bacteria) to fluoresce red, while healthy enamel fluoresces green. Spectra further highlights potential carious lesions in different colors.<sup>3</sup> Along with the colors, a numerical reading defines the potential caries activity on a scale from 0 to 5. The data captured by Spectra are automatically processed and can be viewed and stored within the patient's electronic chart by most compliant dental imaging software programs. Unlike most other caries detection aids, this unit provides an effective visual, as well as a numerical, reading.<sup>4</sup>

There are many advantages to using the Spectra caries detection device. The Doppler radar image created is ideal for patient education. The entire tooth surface is mapped with color-coded areas that indicate not only the presence of decay, but also the estimated depth of the lesion. This allows the patient to truly understand what is occurring in his or her mouth. The caries "map" can discern those lesions that require surgical intervention (drilling) from those that do not.<sup>5</sup> Spectra is an ideal complement to radiographs during patient examinations, as well as an effective tool to promote better oral hygiene. Hygienists can show their patients areas of plaque and tartar they are missing during home care to help prevent decay and periodontal problems. This device can be used as quickly as an inspection with a mirror.

### Case Presentation

The patient, a 13-year-old girl, had presented for a recall hygiene appointment (Figure 1 through Figure 3). During her examination, the Spectra caries detection device was used to scan the patient's mouth and to store the photographs of the areas that needed attention. A number of areas revealed the need for treatment. A discussion took place with the patient and her mother regarding treatment plan options for the teeth noted. The lower right quadrant would be treated—particularly tooth No. 28—using Spectra caries detection throughout the procedure (Figure 4).<sup>6</sup>

The patient was anesthetized with Septocaine® (Septodont, www.septodontusa.com), and a DryShield™ (Incept,

www.dryshield.com) isolation unit was used for retraction of the tongue and cheek, as well as high-speed evacuation. During initial visual inspection, the tooth appeared stained, and a sharp explorer detected no soft areas in the enamel (Figure 5).<sup>7</sup> Photographs were taken using the CamX Spectra and the EyeSpecial C-II camera (Shofu, www.shofu.com). Spectra showed two separate readings, 1.6 and 1.2 in the mesial and distal pits, respectively (Figure 6). A Midwest E Electric Handpiece (DENTSPLY, www.dentsply.com) and diamond bur were used to remove the decay.<sup>8</sup> Once the preparation had begun, it was obvious that the decay was present and had penetrated into the dentin (Figure 7), as shown by the higher number—1.9—obtained by the Spectra photograph (Figure 8).<sup>9</sup> To keep the preparation conservative, the Spectra caries detection device was used until no further decay was noted in the tooth (Figure 9).

The preparation was cleaned and dried, leaving a slightly moist surface. The tooth was etched with a 35% phosphoric-acid solution (Ultra-Etch®, Ultradent, www.ultradent.com). A universal



Fig 1.



Fig 2.

Fig 1. Patient presenting for treatment on tooth No. 28. Fig 2. Facial retracted smile view of the patient. Fig 3. Mandibular retracted arch view of the patient. Fig 4. Preoperative view of tooth No. 28.



Fig 3.



Fig 4.



Fig 5.

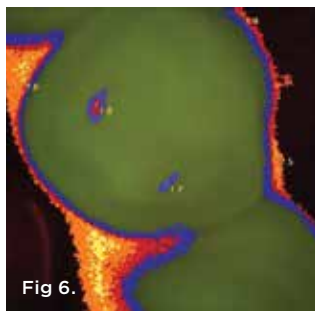


Fig 6.



Fig 7.

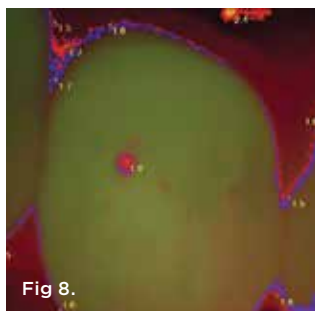


Fig 8.

**Fig 5.** Close-up view of tooth No. 28 showing stain in the grooves. **Fig 6.** Scan view showing the readings obtained from the Spectra caries detection aid. **Fig 7.** The initial penetration into dentin and depth of the decay. **Fig 8.** Scan following the initial penetration into dentin; the device reading shows further decay requiring additional removal. **Fig 9.** Caries-free tooth ready for restoration. **Fig 10.** The final scan of the tooth after the restoration was placed. **Fig 11.** The final composite restoration.



Fig 9.

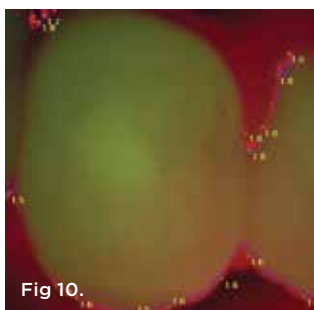


Fig 10.



Fig 11.

adhesive (ALL-BOND UNIVERSAL<sup>®</sup>, Bisco, Inc., [www.bisco.com](http://www.bisco.com)) was scrubbed into the preparation, and the excess was removed with a microtip. The tooth was light-cured for 10 seconds. An A2 shade composite (Herculite™ Ultra, Kerr Dental, [www.kerrdental.com](http://www.kerrdental.com)) was used. The restoration was contoured, light-cured, and polished.

The final result was esthetic and extremely conservative (Figure 10 and Figure 11). The patient was seen 4 weeks later and reported no sensitivity as a result of the treatment. The techniques and materials used in this case allowed for a conservative treatment while delivering an excellent result for this young patient.

## Discussion and Conclusion

This case presented a challenging predicament that clinicians face daily in dentistry. Teeth that may appear caries-free with the use of an explorer can now be examined in more detail with the use of caries detection devices. The availability of reliable devices that allow clinicians to be conservative and assured of the appropriate treatment needed can only enhance dentistry as a profession.

This case showed a successful outcome using modern technology at its best to enhance the result for the patient. Overall, incorporating a caries detection aid into patient examinations (and during treatment) allows clinicians to bring a greater sense of certainty to their diagnosis by providing data to support treatment decisions. Enhanced caries detection capability, clear-cut patient communication, and conservative treatment make these devices indispensable in the dental practice.

## ABOUT THE AUTHOR

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