

Advancement in Early Detection Tools

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Abstract :

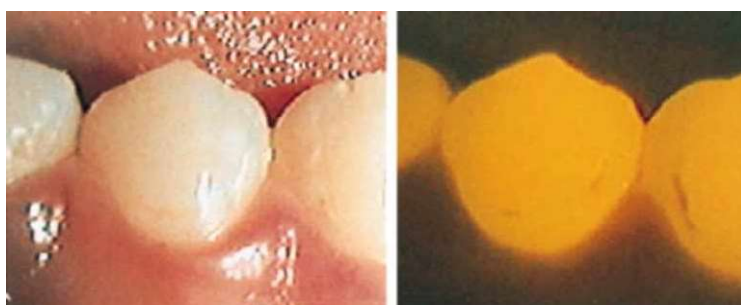
Dental caries are a common and global concern. Demineralisation of enamel remains a global issue. Prevention is an ideal way of managing a tooth with minimal approaches using early detection and diagnosis methods. However, the recent field of dentistry has advanced techniques and has transformed the ways of managing dental caries.

In the recent era, dental radiographs and imaging are still the conventional methods to identify caries. However, the early growth of lesions is missed. This article will present the early detection tools for caries based on different methods. Diagnostic tools have the ability to aid a clinical examination in detecting early lesions and allowing objective monitoring with time.

Keywords: fluorescence, dental caries, preventive methods, diagnostic tools.

1. Quantitative Laser Fluorescence(QLF):

- This technique is best suited for coronal caries as sound enamel fluorescence when illuminated by laser light of a specific wavelength.
- Demineralized enamel results in a decrease in fluorescence compared to surrounding sound enamel, this level of reduction is related to the amount of enamel lost.
- The amount of fluorescence depends upon the level of demineralization, therefore QLF has limited potential in elderly patients.^(1,2)
- The researchers came to the conclusion that a sensitive clinical technique appropriate for longitudinal measurement of early caries lesions on smooth surfaces is the quantitative light fluorescence approach.⁽²⁾



Left: Shows a clinic picture of an enamel from the buccal surface with a white lesion

Right: shows the same white spot with laser fluorescence.

1. The DIAGNOdent

- DIAGNOdent is seen in the pen form but works slightly differently than QLF. The red laser light is emitted towards the carious lesion, and the fluorescent light is then picked up by fiber optics. This device only provides numerical readings only and does not record images or videos.^(5,6)
- The laser light is reflected and filtered out, and the amount of fluorescent light is quantified giving an object reading. (The fluorescence is thought to be a bacterial by-product within a lesion named *porphyrins*)⁽⁶⁾
- DIAGNOdent is particularly used to detect occlusal caries, however, plaque, calculus, and staining also fluorescence, and hence false positive readings are given.
- There is a moderate relationship between DIAGNOdent readings and the depth of the lesion and remaining thickness of the sound between the lesion and the pulp. Therefore, it has more potential to read root caries as a preventive treatment.⁽⁵⁾
- However, DIAGNOdent has been reported poorly to correlate with the depth of the carious lesions and not detecting them over a period of time.

2. Electronic Caries Monitor(ECM)

- Pores that are created during the carious process are filled with moisture and ions from saliva leading to an increased conductance of electric current. And, the basis of this technique is that sound enamel is an excellent electrical insulator.⁽⁶⁾

- Using the site-specific method to take readings, the ECM has the potential to accurately detect early occlusal caries and has been shown to give readings that strongly correlate with lesion depth and mineral content within the enamel lesions.⁽³⁾
- The ECM has also been used in the elderly population to detect early caries.
- The ECM operates on a low single frequency (23Hz) AC, which measures the '*bulk of resistance*' of teeth.
- ***It is important to emphasize that this device only assists a thorough clinical examination of clean, dry teeth with the aid of magnification and radiographs.***⁽⁶⁾
- Other factors that can influence the readings of ECM are dehydration state, presence of stains, and tooth maturation state.⁽³⁾

Discussion

Fluorescence can be used as an early detection method for caries because it shows the difference in fluorescence observed between the sound and the demineralization of enamel, which is greater when light is illuminated in a blue and green range. Studies have shown a good correlation between QLF and longitudinal microradiography for both artificial and natural lesions.

Conclusion

Scientific evidence states that early carious lesions can be prevented and can be reversed if possible. The only challenge dentists face is to determine whether the preventive invasion or the combination of preventive and restoration is required based on the severity and the active status of the carious lesion. However, the modern era consists of several detection methods for caries for early prevention. But, these come with their own pros and cons. No single caries detection method

can work on all surfaces and under every circumstance. Therefore, the clinician has to know which tooth surface or method will benefit them the best. DIAGNOdent works better on advanced caries lesions while QLF is better suited for early lesions. Yet it has to be shown if they have a positive impact on patients' oral health outcomes.

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