

ABSTRACT

Tooth decay is one of the most common infectious diseases. Its early detection is important to prevent the progression of the disease, and thus the emergence of a whole range of complications. Modern diagnostic methods such as laser fluorescence (DIAGNOdent) or transillumination (DIAGNOcam) are reliable in caries detection, especially in ex-vivo studies. However, they have their limitations in clinical use and are therefore only recommended as adjuncts and have not become widely used in practice. Diffuse reflection spectroscopy (DRS) is one of the methods of optical spectroscopy and is based on the principle of measuring the interaction of light with biological tissue. DRS is an experimental method for dentistry today.

Currently, we are not aware of a study that would investigate the detection of dental caries using the DRS method in greater detail. This work deals with the possibilities of this method in the analysis of hard dental tissues and its use in the detection of dental caries. The study is divided into 5 parts: The first part deals with the capabilities of DRS to compare individual hard dental tissues. The second part deals with the ability to detect tooth surface demineralization caused by acids. The third part of the study is devoted to the differences in spectra between healthy and caries-damaged tissues and tries to characterize these differences and determine which of them are crucial for the diagnosis of dental caries. The fourth part deals with the detection of hidden dental caries under an intact tooth surface, when the caries is detected through intact hard dental tissues. The last part of the study deals with the comparison of the DRS method with other dental caries detection methods that are already used in clinical practice.

The results show that the DRS method makes it possible to characterize individual hard dental tissues. Demineralization caused by etching with orthophosphoric acid or hydrofluoric acid, which causes only surface demineralization, cannot be detected with it. DRS can reliably distinguish enamel and dentin caries. The results of DRS in the detection of dental caries are better in comparison with the visual detection of dental caries ICDAS and with the DIAGNOdent instrument method, which is based on the principle of laser fluorescence.

DRS therefore has the potential to become a high-quality and reliable caries detection method. Other studies indicate the applicability of this method in periodontology as well.

Keywords

Dental caries detection, laser fluorescence, diffuse reflection spectroscopy, ICDAS.