# Optical Coherence Tomography and VistaCam Evaluation of Teeth Cavities

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## INTRODUCTION

Minimal invasive dentistry is a new trend nowadays, which allows optimal esthetic with maximum conservation of healthy tissues. In this perspective, the usage of different modern diagnostic tools to accurate diagnosis of incipient carious lesions are significant. Vista Cam iX is a valuable instrument to obtain all requests of modern dentistry concepts, accurate diagnosis with different interchangeable heads and special software to analyze and storage of obtained data for further follow-up, but this device still has some limitations and requirements for accurate diagnosis such as the effect of different biological products and probabilities to overdiagnosis.

## OBJECTIVES

The present study compares the performances of two imagistic evaluation methods to identify and to locate the teeth cavities.

## METHODS & MATERIAL

The Vista Cam iX (Durr Dental, Bietigheim- Bissingen, Germany) intraoral self-calibrating fluorescence camera have been used during this study, two interchangeable heads of this device have been used during this study. “Proof” interchangeable head connected to the laptop with special software (DBSWIN, Durr) to analyse the acquired image. This head emits LED high-energy blue-violet light at 405 nm on the occlusal tooth area [46]. Violet exceeded by this device excite metabolites of cariogenic bacteria which causing them to light up in red colour, in contrast to its sound enamel showing green colour. Carious tissue and healthy tissue emit fluorescence at different intensities when excited by light at specific wavelengths. Digital image show lesions in different colour shades with a numerical score between 0 and 3, showing the extent and depth of occlusal caries, this is helping to find so-called “hidden caries and easily detecting occlusal dentin caries lesions in permanent and deciduous teeth underlying a clinically intact tooth surface. The International Caries Detection and Assessment System (ICDAS-II) indicate visual inspection to score caries lesions.

The Time Domain en-face optical coherence tomography (TDOCT) system with a pigtailed super-luminescent diodes (central wavelength of 1300 nm and spectral bandwidth of 65 nm) was used for this study. The OCT longitudinal resolution was 17.3 micrometers in tissue and the distance between the slices was 10 micrometers. The en-face scans provide an instant comparison to the familiar sight provided by direct view or by a conventional microscope. Features seen with the naked eye can easily be compared with features hidden in depth. Sequential and rapid switching between the en-face regime and the cross-section regime, specific for the en-face OCT systems, represents a significant advantage in the non-invasive imaging as images with different orientations can be obtained using the same system.

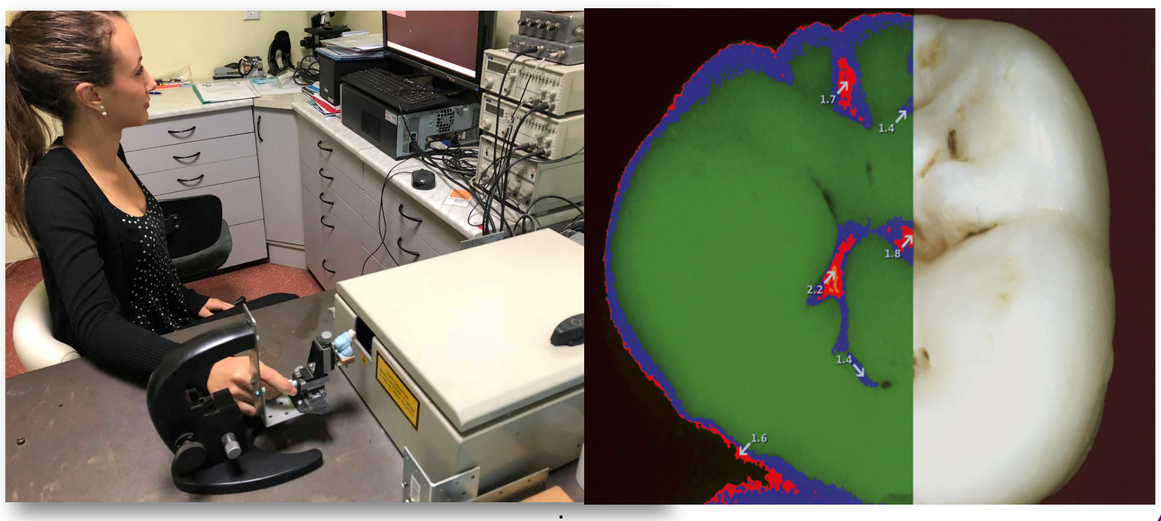

*Figure 1. The architecture of the Time Domain OCT System used in this study versus Vista cam.*

## RESULTS

A male patient of 22 years old with without general diseases, non-smoking with occlusal pit and fissures caries of lower left first molar ICDAS to score 3 and (DBSWIN, Durr) software value 1.2 to 1.9. The initial analyses have been done with Vista Cam IX “proof” interchangeable head showed 7 sites of carious lesions with different depth and diameter and have been made picture of the most profound carious lesion on the mesial groove of the lower first molar with high magnification intraoral camera of Vista Cam iX . The patient did not strictly follow all doctor’s recommendations during this period and re-examination with Vista Cam iX “proof” interchangeable head after 12 months showed slight enlargement in diameter on caries reaching DEJ with values from 1.5 to 1.9 according to manufacturer’s scale.

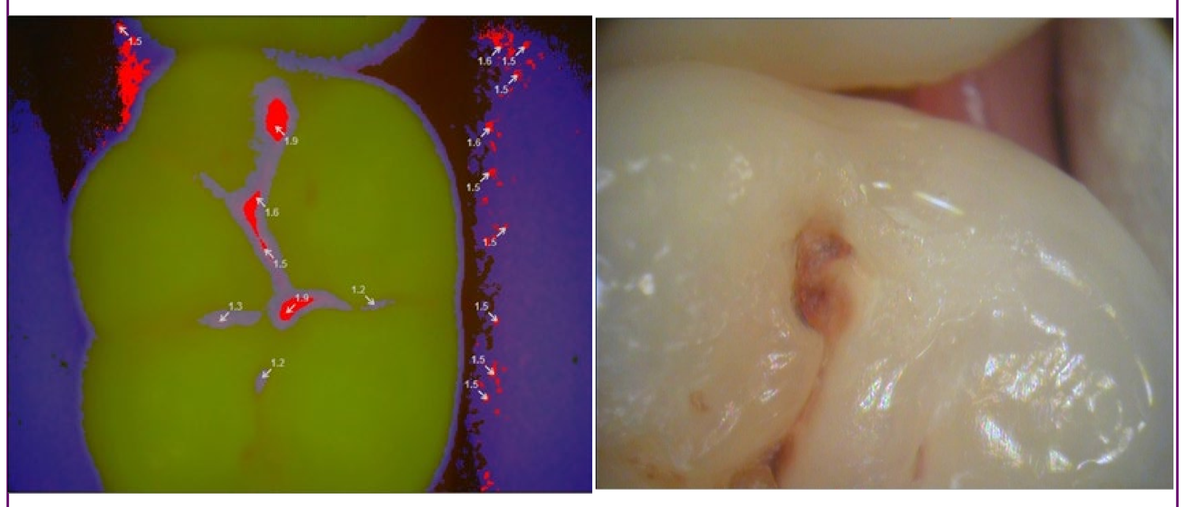

*Figure 2. Initial examination with “proof” interchangeable head (left image) and intraoral picture of the most profound carious lesion (right image).*

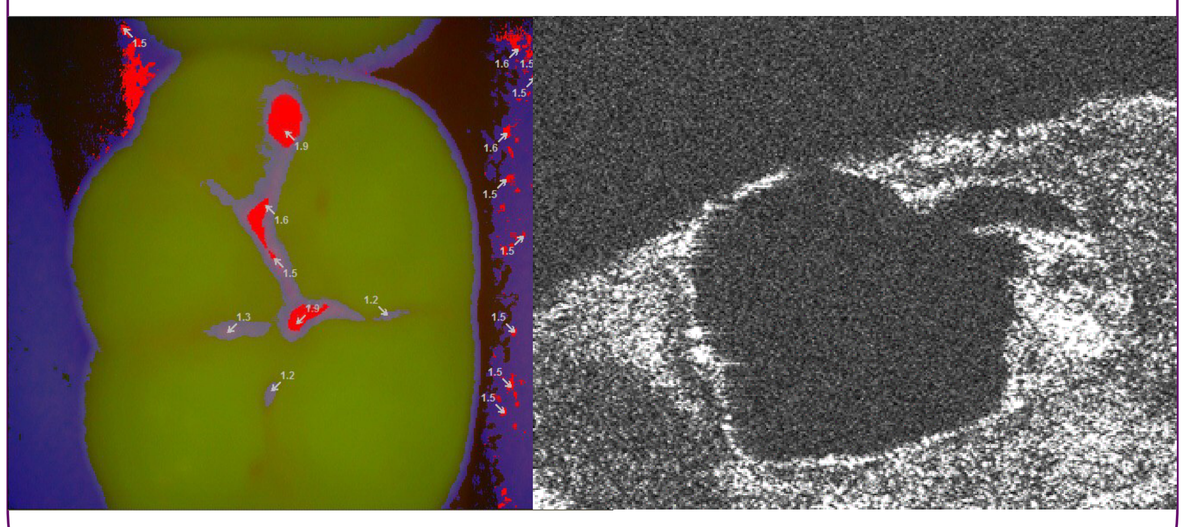

*Figure 3. Re-examination after 12 months shown slight enlargement in diameter on the deepest carious lesion with values 1.5 to 1.9 (left image) and OCT evaluation showing a bigger tissue damage for the profound carious lesion (right image).*

## CONCLUSION

Understanding the nature of the carious process and changing the old definition about caries as it was an irreversible disease which needs invasive treatment to a new definition that caries is reversible disease has a stage of demineralization and re-mineralisation that lead to a new era of protection through prevention. Increasing dentist knowledge, using modern diagnostic tools for early caries detection, selection of proper material or manipulations that delay or prevent tooth demineralization and enhance tooth remineralisation are factors that are influencing the success rate of tooth prevention against carious lesion; especially in the pit and fissure occlusal surface of the tooth.

Ideal cavity detection method should capture the whole spectrum of carious lesions from the earliest to advanced stages. It should be precise, easy to handle and useful for all surfaces of the teeth. Combination of different methods such as ICDAS, high magnification intraoral camera and Vista Proof fluorescence camera, exhibited an adequate clinical efficacy and obtained data can help dentists and researchers to choose the best method of detecting caries lesions on occlusal surfaces. OCT and Vista Cam Proxi interchangeable heads are useful in the detection of proximal caries as well as OCT is useful in the detection of residual dentinal caries after cavity preparation.

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