



## Dental OCT system for diagnosis of caries and tooth crack

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Optical coherence tomography (OCT) is a direct imaging tool for internal biological structure without any X-ray irradiation. OCT images differentiate the optical properties of tissues, including the effects of both optical absorption and scattering. High imaging resolution of OCT has a potential to revolutionize the diagnosis of diseases in various medical fields. Recently, dental OCT system has been developed and approved for practical application in Japan. Our previous studies showed that dental OCT system had excellent capabilities for diagnosis of dental caries and tooth cracks over the conventional method. Accurate diagnosis of caries progression is essential for the management of caries and prognosis of adhesive restorations. Modern imaging technology provides the opportunity to detect caries and tooth crack on 3D images, thus overcoming the limitations of conventional 2D methods. High-speed imaging of dental OCT provides an increased number of cross-sectional images that are acquired in a sequence for the generation of 3D data sets, which contain comprehensive structural information that enables evaluation of the feature or defect inside a structure. Since 3D OCT can pinpoint the lesion location in three dimensions, this can aid the selection of a less invasive and more precise treatment approach.

Demineralized enamel and dentin are imaged as bright zones because of the formation of numerous micro-porosities where the backscatter of OCT signal is increased. The depth of demineralization and caries penetration into the dentin can be estimated by considering the location of the DEJ. In case of caries with cavitation, the border of the hollow space is clearly imaged. Consequently, OCT is capable of imaging hidden caries beneath seemingly sound surface.

OCT is also capable of imaging tooth crack as a bright line because of increased backscattered signal along the crack line. As OCT has no risk for ionizing radiation, additional images with an altered position or scanning angle can be performed for imaging tooth crack. OCT has a high degree of sensitivity and specificity for diagnosis of tooth crack penetrating into dentin. Since most coronal cracks could be managed successfully in a single visit using adhesive materials, early diagnosis is most important in the treatment of tooth crack to limit the propagation of crack.

Dental OCT can be applied to the patients such as pregnant women, young children or where X-rays cannot be used such as aged care facilities.

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### <Curriculum Vitae>

1987	Graduated from Tokyo Medical and Dental University
2017 – 2021	Associate Professor, Okayama University
2021 – present	Professor, Tokyo Medical and Dental University
1997 – 1999	National Institute of Standards and Technology
2007	American Dental Association Health Foundation, Paffenbarger Research Center