

**Determination of dental decays rate development with optical coherence tomography.**

Anderson Zanardi de Freitas, Denise Maria Zzell, Nilson Dias Vieira Jr.  
*IPEN - CNEN/SP*

Anderson Stevens Leonidas Gomes  
*Departamento de Física - Universidade Federal de Pernambuco*

Adriana Costa Ribeiro  
*Faculdade de Odontologia - Universidade de São Paulo*

Marcia Pinto Alves Mayer  
*Instituto de Ciências Biomédicas - Universidade de São Paulo*

Optical Coherence Tomography was used to monitor *in vitro* subsurface caries evolution process. Twenty-five human third molars, were used in this study and bacteria were employed to induce caries lesions. The teeth were cut longitudinally at mesio-distal direction; the surfaces were coated with nail varnish except for two squared windows (2x4 mm); at the cement-enamel junction. Artificial lesions were induced by a *S. mutans* microbiological culture. The samples (N=50) were divided into groups according to the demineralization time; 3, 5, 7, 9 and 11 days. The culture medium, was changed each 48 hours. After the demineralization process the samples were rinsed with double-deionized water and stored in a humid environment. The OCT system with a Michelson interferometer was implemented with average power of 96  $\mu\text{W}$  in the sample arm, providing a 23  $\mu\text{m}$  of axial resolution. The images were produced with lateral scans steps of 10  $\mu\text{m}$ . The detection system was composed by a detector, a demodulator and a computer. With the images generated by OCT it was possible to determine the lesion depth as function of sample exposition time to bacterial culture. We observed that the depth of the lesion in the root dentine increased from 70  $\mu\text{m}$  to 230  $\mu\text{m}$ , depending on exposure time, and follows the bacterial population grow law. This OCT system accurately depicts hard dental tissue and it was able to detect early caries in its structure, providing a powerful contactless high resolution image of lesions.