Noninvasive Alternative Techniques for the Early Detection of Occlusal Overload

C Marcauteanu[1] C Sinescu[1] M Negrutiu[1] E Demjan[1] G Dobre[2] & A Gh Podoleanu[2]
[1]*„Victor Babes" University of Medicine and Pharmacy Timisoara, Romania.* [2]*Applied Optics Group, School of Physical Science, University of Kent - Canterbury, UK*

INTRODUCTION: Bruxism is a parafunction that causes heavy occlusal loads. Our research team proposed for the first time the microstructural characterization of occlusal overloaded dental hard tissues by means of optic coherent tomography (OCT) in vitro [1]**.** The reliable results of that preliminary OCT investigation encouraged us to continue and to restrict the in vitro OCT examination to maxillary anterior teeth, which are most frequently exposed to occlusal overload in patients with horizontal bruxism.

METHODS: OCT was used to investigate 12 extracted maxillary anterior teeth, derived both from patients with active bruxism and from subjects without parafunction. All 12 examined teeth had no pathological attrition. Prior to the extraction of teeth, the patients were screened for bruxism by means of a Bite Strip device. Five of them had first degree bruxism and the other seven didn't practice that parafunction. An OCT microscope from Michelson Diagnostics Ltd of Kent UK was used for this study. The system uses an 1300 nm swept-source laser and can capture real time images 6mm wide with better than 10 micrometers optical resolution in both axial and lateral directions over the 1 mm imaging depth in the probe.

RESULTS: The OCT investigation of seven maxillary anterior teeth derived from patients without bruxism revealed homogeneous structure of the superficial enamel (fig. 1).

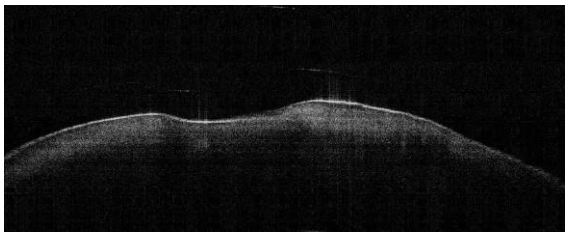

Fig. 1: OCT image of a tooth extracted from a patient with physiological attrition (B Scan in active evolution, image 80 from 100 slices in stuck, 18 degree in air)

Despite the normal morphology of teeth extracted from patients with first degree bruxism, the OCT images showed signs of enamel damage. The occlusal overload produced a characteristic pattern of enamel cracks, which didn't reach the tooth surface (fig. 2).

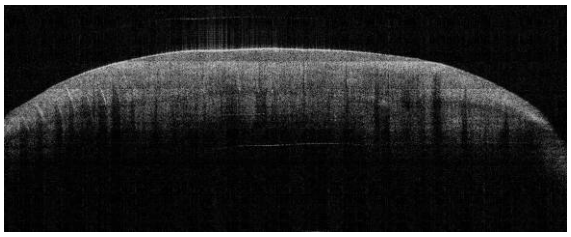

Fig. 2. OCT image of teeth from patients with active first degree bruxism (B Scan in active evolution, image 79 from 100 slices in stuck, 18 degree in air).

DISCUSSION & CONCLUSIONS: The group of applied physics from Kent used **an OCT** system and concluded on the possibility of measuring the mineralization/ demineralization degree of hard tissues in carious lesions [2]. The members of our team have allready used OCT in vitro as a noninvasive method for the detection of defects in ceramic masses and for the vizualization of defects in reinforced complete dentures [3]**.** In a preliminary OCT investigation we also identified a characteristic microstructural pattern for teeth with various degrees of dental wear [1]. The present study was focused on maxillary anterior teeth with a normal morphology, derived from patients without and with occlusal overload induced by active bruxism. The „hidden" occlusal overload was efficiently identified by means of OCT.

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