

## THE DETECTION OF DENTURE MATERIAL DEFECTS BY A NON- INVASIVE METHOD

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**INTRODUCTION:** When making a denture or removable partial prosthesis, long term preservation of structure and function requires that potential irritating effects are kept at minimum.

In order to avoid the deficiencies of the prostheses made by the classical pressure-pack technique, several alternative procedures were devised, directly related to the material used and also to the manufacturing technology. Thus, at the present time, there are several injecting systems and technologies on the market, that use chemoplastic materials. There are also technologies that plasticise a hard cured material by thermoplastic processing (without any chemical reaction) which is then injected it into a mold.

**METHODS:** Several complete dentures were made using the conventional pressure-pack procedure, the SR-IVOCAP injecting system, the aspiration-injection system and the thermoplastic molding system.

We also made full dentures with reinforced bases with polymer preimpregnated glass fiber net, polyethylene and glass fiber net - light and heat cured resin and golden metal net.

In this work we used an *en-face* OCT system<sup>1, 2</sup>, which can deliver B-scans and C-scans from *en-face* (or T-scan) reflectivity profiles. The OCT system operated at 1300 with a low numerical aperture (NA) interface optics which gives a large field of view of 1 cm by 1 cm, but relatively low transverse resolution of 25 μm. Both systems have typical working distances of 2 to 3 cm and depth resolution of 18 to 20 μm (in air).

**RESULTS:** In all of the investigated prostheses, especially in the dentures made using the conventional pressure-pack procedure we found defects which may cause their fracture. These defects are totally included in the prostheses material and can not be visualised with any other imaging methods. The polymeric material is very porous. The areas depicted present several small

canals in the base that can be colonized in time with bacteria (Fig. 1).

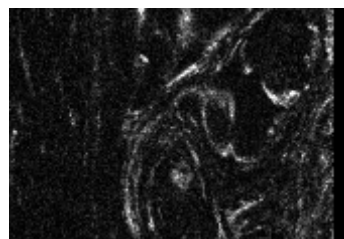


Fig. 1: Detection of areas with small canals in the denture's base produced using the classical method. *en-face* proximal scanning, 5 mm lateral size, 0.2 mm depth inside.

**DISCUSSION & CONCLUSIONS:** The defects identified above can lead to fractures of prostheses or/and to bacterial infiltration. Dentures with reinforced base present defects especially at the interface between the reinforcing material and the acrylic denture polymer. In order to avoid future prosthetic failures, it is important to employ a non-invasive imaging method such as OCT as demonstrated here to assess the quality of dental prostheses before their insertion in the oral cavity.

**REFERENCES:** 1. B. T. Amaechi, A. Gh. Podoleanu, S.M. Higham, D. Jackson, Correlation of Quantitative Light-induced Fluorescence and Optical Coherence Tomography Applied for Detection and Quantification of Early Dental Caries, *Journal Biomedical Optics*, **8(4)**; 642-647; 2003.; 2. Amaechi, A. Podoleanu, G. Komarov, J. Rogers, S. Higham, D. Jackson, Application of Optical Coherence Tomography for imaging and assessment of early dental caries lesions, *Laser Physics, Special Issue No.2, Laser Methods in Medicine and Biology*, **13(5)**, 703-710, May 2003.

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