

Optical Coherence Tomography (OCT) in Removable Prosthesis

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Introduction

Dental prosthesis, as a dental specialty, ranges from the partial restoration of a dental element to the total functional rehabilitation of dental arches through implant-supported prostheses

optical coherence tomography

- **The optical coherence tomography (OCT) technique has many medical and dental applications for diagnosis and assessment of different clinical conditions**

Assessment of demineralization status of teeth
Monitoring of carious lesions
Assessment of enamel defects in molar incisor hypoplasia
Assessment of noncarious tooth surface loss

Restorative dentistry

Assessment of marginal fit of fixed partial denture
Assessment of marginal fit of crowns
Assessment of cemental lines in lumineers

Prosthodontics

Clinical applications of optical coherence tomography in dentistry

Implant dentistry

Assessment of nerve proximity
Assessment of implant-abutment interface
Assessment of peri-implant mucositis

Miscellaneous

Assessment of cracks and fissures
Assessment of root fractures
Assessment of internal structure of root canal
Visualization of mesiobuccal two in upper first molar

Oral pathological lesions

Assessment of degree of dysplasia
Assessment of vesiculobullous lesions
Detection of malignancy

Periodontology

3D visualization of dental biofilm
Visualization of periodontal structures
Measurement of pocket-sulcus depth
Evaluation of gingival regeneration

Orthodontics

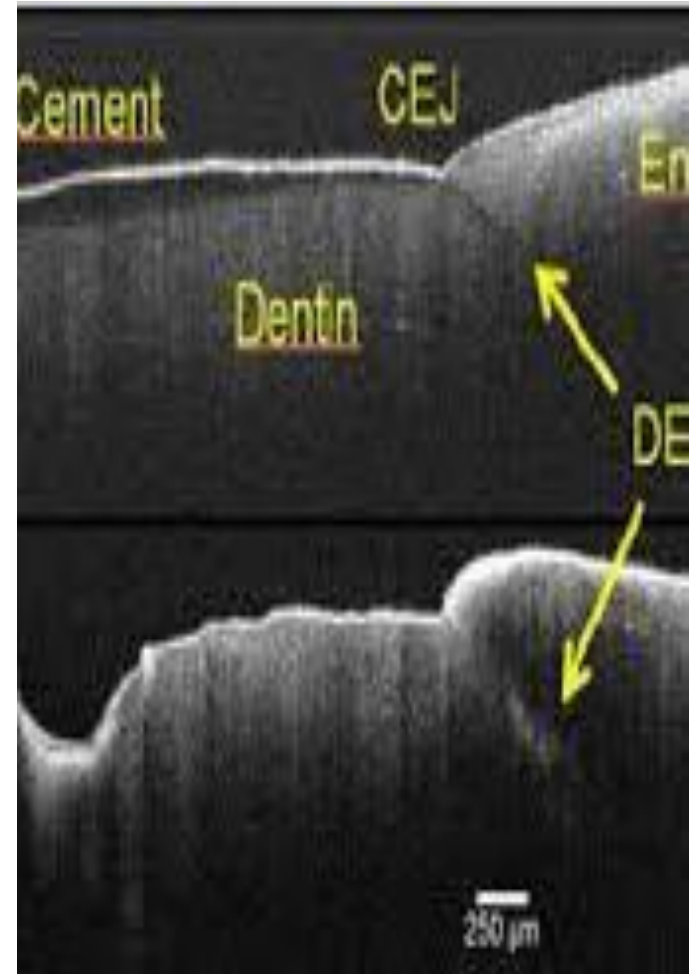
Assessment of surface characteristics of enamel after orthodontic treatment
Assessment of adhesive remnant after debonding

Handheld/Mobile Devices for OCT

- The introduction of handheld or mobile devices for OCT has played a key role in incorporating this new diagnostic modality in various specialities such as otorhinolaryngology, ophthalmology, and dentistry. The size, design, and grip are now being customized as per the demands of various specialties. The tube-like device systems with endoscope heads are preferred by dentists, while the pistol-like grip is used by an ophthalmologist.**

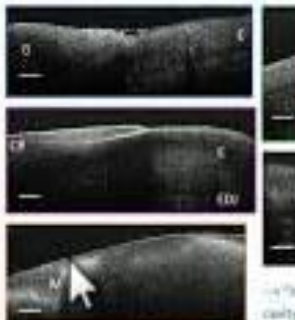
Biomedical and clinical research

- The Fourier-domain optical coherence tomography (FD-OCT) is the technique currently applied and has two approaches: swept source OCT (SS-OCT) and the spectrometer-based system (spectral domain OCT, SD-OCT), which are based on low-coherence interferometry. The light from the source is split into a sample and a reference. The back reflected light from the sample (sample arm) and the reference mirror interfere with each other, and the resulting signal (spectrum) is then recorded by the detector.**



ORICO
OPTICAL
COH
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ENDO SCOPIC OCT



enamel
dentin
cavity

D., dentin
C., cementum
M., residual dentin defect

Source: ORICO OPTICAL COH. ENDOSCOPIC OCT IMAGING OF ENDODONTIC REPAIRS

The use of OCT will be addressed as a conservative evaluation technique for dental prostheses, as well as for the assessment of the health of adjacent hard and soft oral tissues.

OCT is a non-invasive technique, which obtains real-time, contactless, high-resolution cross-sectional images based on the principle of the optical interferometer, using a non-ionizing, near infrared reflected light, to enable quantitative and qualitative in vitro, ex vivo and in vivo evaluation of living tissues

Removable Prosthesis

Edentulism is the result of a combination of factors: social, educational, cultural, as well as the influence of previous dental treatments. Oral rehabilitation, functional and aesthetic, was initially achieved through removable prostheses, either total or partial

The use of acrylic in dentures has already been associated with changes in the oral mucosa of patients who use removable dentures, especially for a longer period, because its physical-mechanical properties undergo changes, such as mechanical and chemical wear and influence of smoking, poor hygiene and eating habits that lead to changes in the pH of the oral environment

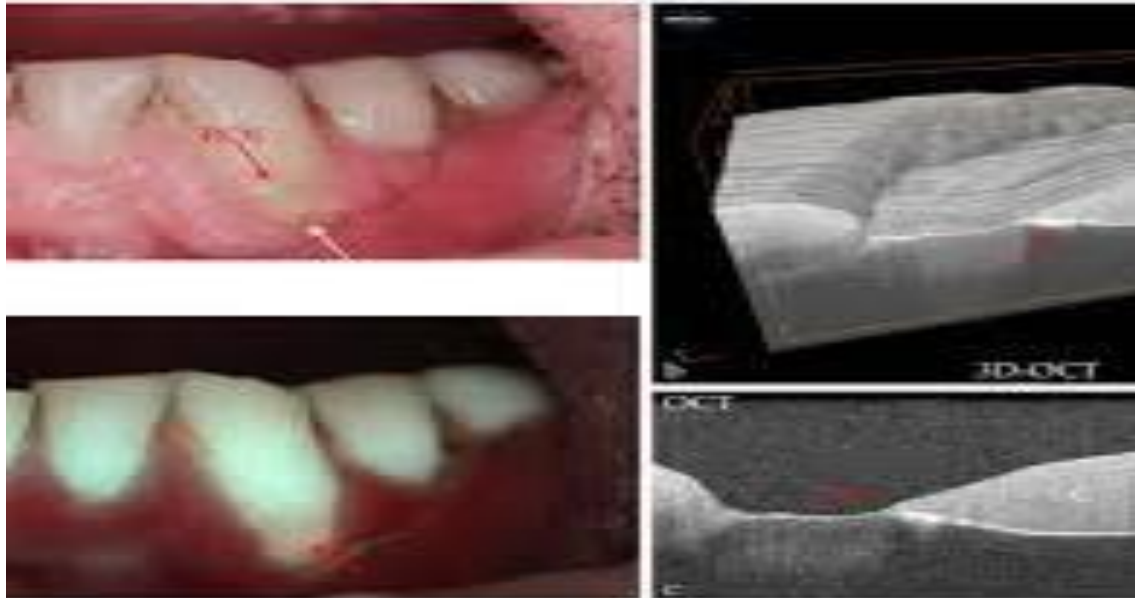
Finished dentures, made with two types of resin, self-curing ,and thermo -polymerizable ,have been assessed with using Swept Source-OCT instrument .The image depth was up to 6 mm, depending on the optical properties of the evaluated resin, enabling the visualization of internal structural differences in the resin base of the prostheses, with greater irregularities and pores in the bases made with self-curing resin, facilitating the accumulation of biofilm, decreasing resistance and favoring pigmentation

Demonstration the positive effect of decontaminating PMMA resin samples for the manufacture of dentures colonized by *C. albicans* and *S. mutans* by means of full-field OCT ,with the use of unsaturated fatty acid salts (oleate, linoleate and linolenate solutions). The OCT technique allowed the verification of the detachment of the biofilm from the substrate by visualization of gaps at the interface.

The OCT (en-face OCT) technique was used to analyze dentures made by the conventional pressure-pack procedure method and dentures made with a pre-impregnated polymer glass fiber net reinforcement internally in its structure. Defects in the internal structure of the prostheses were observed that were impossible to be visualized by other methods. Such defects could result in fracture of the prostheses, or in the appearance of porosities, which could be colonized by microorganisms

Removable partial dentures have a metallic structure due to the mechanical stresses suffered and to provide stability. Metal alloys are normally used, and initially they had a high gold content, to avoid corrosion in the oral cavity. Currently, nickel-chrome (Ni-Cr) and cobalt-chrome (Co-Cr) alloys are the most used in removable partial dentures, for economic reasons. There is a concern about the toxicity of these elements and the possibility to cause reactions such as gingivitis and periodontitis.

Changes in gingival volume can be assessed by OCT, and it is a clinical parameter to gingival health, with bleeding on probing and depth probe.



Thank You!