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CHANGES IN CRYSTALLINE STRUCTURE IN DENTAL ENAMEL IRRADIATED WITH Er,Cr:YSGG, Ho:YLF And Nd:YAG LASERS

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Background and Objective: This study aimed to identify the crystalline changes on enamel irradiated with Er,Cr:YSGG, Ho:YLF or Nd:YAG laser aiming caries prevention.
Study Design/Materials and Methods: Twelve enamel slabs were obtained from human teeth and divided into 4 groups. G1 = untreated. G2 = 2.8 J/cm^2 from Er,Cr:YSGG laser 2.79 μm, 140 μs pulse width, rep rate 20 Hz. G3 = 700 J/cm^2 from Ho:YLF laser 2.065 μm, 400 μs pulse width, single pulses. G4 = 85 J/cm^2 from Nd:YAG laser 1.064 μm, 100 μs pulse width, rep rate 10 Hz. Crystalline structure of enamel was evaluated by x-ray diffraction at a Synchrotron monochromatic x-ray beam with wavelenght 0.0954 nm. The indexing of peaks was conducted using International Centre for Diffraction Database.
Results: The x-ray diffraction pattern corresponding to irradiated enamel shows six new peaks for the Er:Cr:YSGG, four for the Ho:YLF and four for the Nd:YAG irradiated enamel, indicating that the irradiated enamel are composed of a mixture of hydroxyapatite and new crystalline phases, which were assigned to the tetracalcium phosphate in all laser cases, plus tricalcium phosphate in phase α and β for Nd:YAG. The decrease in solubility of the irradiated enamel is also associated to the new crystal size as well as to the carbonate loss.
Conclusion: The present study suggests that laser irradiation on enamel can promote the formation of tetracalcium phosphate and tricalcium phosphate in enamel. This finding can clarify the pre-clinical observations related in the literature and may contribute to an improved overall resistance of irradiated enamel to demineralization with Er,Cr:YSGG, Ho:YLF or Nd:YAG lasers.

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CHOOSING THE BEST TYPE OF DENTAL LASER

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Background and Objectives: Finding the best laser type and strength for dental usage is a challenge, as laser differs in wavelength, power and in application characteristics.
Study Design/Materials and Methods: The types of lasers discussed here in this abstract are: 1- Carbon dioxide laser that is used in gingivectomies, biopsies, and removal of benign and malignant lesions, called (Clean Surgery), as well. 2- Argon laser, used for curing composite, orthodontics, whitening teeth, as well. 3-Holmium:YAG laser is used in TMJ surgeries, and especially on disc interventions. 4- Er:YAG, Er:YSGG: Are used in periodontal operations, however, they are available to be used on hard dental tissues like cavities preparation, Orthodontic etching and composite removal after debonding. 5- Nd: YAG is available to be used in Vaporisation and coagulation of soft tissues, with the benefits of a perfect haemostasis, which improves the taking of impressions, reduces the use of anesthetics and replaces electrocauters. 6- Diode Laser is available to be used in experimental growth modification (in Vitro). In spite of the huge number of laser types, the indicated lasers for dental applications are still few, without distinct indications for each type, what requires more researches on this domain.
Results and Conclusions: Laser in dentistry is a promising domain that still requires more researches.

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OCT INVESTIGATION OF APICAL MICROLEAKAGE–A PRELIMINARY IN VITRO STUDY

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Background and Objectives: The purpose of the study was to investigate the apical microleakage in teeth with laser assisted endodontic treatment using a laser-based method.
Materials and Methods: Thirty recently extracted human maxillary anterior teeth with a single, straight root canal were selected for this study. The root canals were instrumented mechanically with the PROTAPER universal system using the crown-down technique establishing a straight line access. The root canals were exposed to laser irradiation using a 980 nm high power diode laser (pulsed mode; 3 W; 0.01 s on time; 0.01 s of time; 5 seconds/exposure; 3 exposure/procedure). The root canals were filled with Ah Plus in conjunction with gutta-percha cones. The microleakage evaluation method was performed using *en-face* OCT systems which were assembled by the Applied Optics Group of the University of Kent. The optical configurations are represented by two single mode directional couplers with a superluminiscent diode as source. Sequential and rapid switching between the *en-face* regime and the cross-section regime, specific for the *en-face* OCT systems developed by Kent Optics Group, represents a significant advantage in the non-invasive examination of the quality of apical filling. Systems operating 1300 nm were used.
Results: The presence of different dimension voids was identified in all samples. The qualitative evaluation was completed by a quantitative one, using computer software that allows three-dimensional reconstruction of the marginal leakage areas.
Conclusions: OCT is a non-invasive and very accurate method allowing 1 micron thickness investigation slides. Laser-assisted root canal treatment leads to reduction of microleakage as compared with teeth that were treated and filled conventionally.