P7

The Temperature changes in the Pulp Chamber during Cavity Preparation with Er:YAG Laser using very short Puls Technology

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The aim of this study was to examine the temperature changes in the pulp chamber during cavity preparation with Er:YAG laser (λ = 2940 μm) (Fidelis, Fotona, Slovenija), with four possible pulse durations from 100-1000 ms. Nine groups of 20 intact molars were used. One root of each sample was amputated and thermocouple of thermometer (Fluke 52, Fotronic, USA) was inserted in the chamber. Class V cavity preparation in enamel was prepared, then the preparation was proceed in dentine. Enamel was lased with 400, 360 and 320 mJ in contact mode using the very short pulse (VSP) (pulse duration 100 ms). Fiber tip was of 950 mm diameter. Frequencies were 15, 12 and 10 Hz, and period of irradiation 10 s. Dentine was irradiated with 340, 280 and 200 mJ and 10,8 and 5 Hz during 7 s (VSP). Cooling was done with water spray (73 psi). The highest rise in temperature was achieved in enamel by 400 mJ/15 Hz (1.99±0.28 C), and the lowest by 320 mJ/10 Hz (0.70±0.18 C). In dentine the highest increase was achieved with 340 mJ/10 Hz (1.37±0.42 C), and the lowest with 200 mJ/5 Hz (0.43±0.18 C). Cavity preparation with Er:YAG laser using a VSP did not caused clinically significant increase of temperature in the pulp chamber of molars.

P8

Morphological Alteration of Root Surfaces after Apicoectomy and ND: YAG non Contact Laser Irradiation. An In Vitro Study

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Purpose: Evaluate morphological alterations of apical surface, especially surface smoothness, after apicoectomy and Nd:YAG non-contact laser irradiation, in vitro. Material and methods: Thirty extracted human cuspids had their crowns removed and were endodontically treated in a standard technique. Apicoectomy was performed using handpiece. The teeth were divided in three groups of 10 each. Half of the area of each apical surface was irradiated using non-contact Nd:YAG laser, for 30 seconds. Three different powers were used - 1,6 W, 2,0 W and 2,4 W – according to each group. The apical surfaces were studied using SEM. Three "blind" observers evaluated the images obtained, giving to each one smoothness scores. Results were statistically analysed. Results: Areas of melting and recristalization were observed on irradiated surfaces, which seemed compact due to absence of porosity. Craters and areas of thermal damage were eventually observed. Individual evaluation showed better scores of surface smoothness for the lased surfaces, with significant differences at 2000x magnification, but not significant at 500x magnification. There was no difference between the different powers studied. Conclusions: Nd:YAG non-contact laser irradiation of apical surfaces after apicoectomy was able to make them smoother than the unlased ones. However, morphological alterations were not homogeneous along the surfaces, possibly in consequence of the manual application. There was no difference between the different conditions of irradiation applied.

P9

A Comparative Scanning Electron Microscopy Study of Smear Layer Removal on Root Surfaces by Different Etching Modalities and Er:YAG Laser Irradiation

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The aim of this study was to compare in vitro using SEM, the ability of citric acid, EDTA, citric acid with tetracycline, and Er:YAG laser to remove the smear layer from a root surface after manual scaling. Thirty specimens of root surface before scaling were divided into 6 groups. The Control Group (G1) was not treated; Group 2 (G2) was conditioned with citric acid gel 24 %, pH1, for 2 minutes; Group 3 (G3) was conditioned with EDTA gel 24 %, pH 7, for 2 minutes; Group 4 (G4) was conditioned with citric acid and tetracycline gel 50 %, pH1 for 2 minutes: Group 5 (G5) was irradiated with Er:YAG laser (2.94 µm),47 mJ/10 Hz, focused, under water spray for 15 seconds and fluence of 0.58J/cm^2; Group 6 (G6) was irradiated with Er:YAG laser (2.94 µm), 83 mJ/10 Hz, focused, under water spray for 15 seconds and fluence of 1.03J/cm^2. The micrographs were analysed by scores and following statistical analysis using Kruskal Wallis ($p<0.05$) H = 20,31. The G1 was significantly different from all groups (28.0). The G2 (13.4), G3 (11.7), and G4 (13.6) showed no difference in relation to G5 (20.3) and G6 (6.0), but the G6 was significantly different to G5. From the results, it can be concluded that all treatments were effective in removing smear layer; G5 and G6 produced an irregular root surface; G6 was the most effective of all.

P10
Antimicrobial Effects of K.E.Y.-Laser in Root Canals

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Recently it has been shown that bacteria can be killed by Er:YAG laser irradiation This bactericidal effect can be used in endodontics for for canal sterilisation.
The aim of this study was to gain information about the antimicrobial effects of K.E.Y. laser irradiation on bacteria in dental root canals in vitro. 20 extracted human teeth were used, divided into two groups. After enlarging the root canal of the teeth with the conventional method using K-files sizes10-40, all the teeth were sterilised. Following this the root canals were inoculated with Enterococus faecalis bacteria.
Group I (10 teeth) were then treated with K.E.Y. laser: pulse energy 50mJ, repetition rate 15 Hz, 4 passes.
Group II (the remaining 10 teeth) were irrigated with 3 % H_2O_2.
Results showed sterilisation of the the root canals of the teeth in group I.

P11
Pilot Study on Atomic Force Microscopy of CO_2-Tea Laser Irradiated Enamel Surface

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In studies concerning laser applications in oral hard tissues, tooth surface is usually investigated by scanning electron microscopy and associated microanalysis techniques. In this pilot study, the Atomic Force Microscopy (AFM) is evaluated to visualize and quantify structural and morphological changes in enamel surfaces irradiated by laser. The AFM was chosen not only because its high resolution and high contrast imaging capability but mainly due to the fact that quantitative information can be directly obtained from the samples in their natural state (no need of dehydration, coating, staining or even evacuation). Samples were extracted from human and bovine teeth and only the bovine samples were irradiated with pulses of a CO_2-TEA laser. Images of (25 x 25) µm^2 and (10 x 10) µm^2 of scanning area were obtained from random points of the surfaces and prismatic areas (with holes) and interprismatic enamel were easily visualized in unlased samples. The mean diameter and the apparent depth of enamel holes and the RMS roughness (Rq) were directly measured. Lased surface showed typical changes due to fusion and solidification and greater roughness in comparison to unlased surface. Results indicate that AFM is an excellent tool for the proposed task.