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July 31-August 2, 2002
YOKOHAMA, JAPAN

Program and Abstract

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2002 YOKOHAMA

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Laser Dentistry
– Revolution of Dental Treatment in New Millenium –
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39 Evaluation of the Effectiveness of Acid-resistance Using Hydroxyapatite Granules

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Most of the acid-resistance evaluation has been studying by use of extracted teeth, however it appears that there is a chance of vary widely owing to the difference of calcified level of teeth.Particularly, in case of comparing to a small amount of acid-resistance, stable evaluation is required. HA (hydroxyapatite) granules is unified manufacture providing. It is considered that HA could be applied to acid-resistance evaluation. The purpose of this study is to evaluate the acid-resistance using HA granules.
HA granules samples were divided into the following four groups (n=5, 0.1g of HA each in group).
1)APF(Acidulated phosphate fluoride) group : HA granules were reacted with 500μl of APF.
2) Laser irradiation group: HA granules were irradiated with pulsed Nd: YAG laser, irradiation for 100mJ, 20pps 5mins x6.
3) APF and laser irradiation group: HA granules were reacted with 500μl of APF and then ,specimens were irradiated with Nd:YAG laser (the irradiation for 100mJ, 20pps 5mins x6)
4) Control: HA granules were reacted with saline.
The amount of calcium was dissolved in the acetic acid –sodium acetate buffer solution (pH4.2) at 2 hours 37°C.
The amount of calcium was measured by OCPC methods at absorbency levels of 570 nm.
Results were as follow: Calcium flow rate mean ± SD (mg/dl)
APF group: 3.59 ± 0.28 Laser irradiation group: 53.19 ± 4.84
APF and laser irradiation group: 4.46 ± 1.14 Control: 57.39 ± 2.95
The calcium flow rate in APF treatment, and APF and laser irradiation group were significantly lower than the other groups. (ANOVA $p<0.01$). It is suggested that this study model may be useful for the evaluation of acid resistance, and APF treatment and APF and laser irradiation group may be effective for acid resistance.

40 Infrared Absorption Bands Characterization of Dentin Tissue when Irradiated by Erbium Laser

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The erbium laser radiation is highly absorbed by water molecules present in hard tissues. Erbium laser irradiation effects can be classified in two different regimens: ablative, which produces material removal or sub-ablative, that produces a controlled heated process in the irradiated and adjacent regions. For the Er:YAG laser the ablative threshold is very low, around 1.5J/cm^2. When dentin is irradiated bellow threshold, chemical and physical changes can occur. The objective of this work is to identify the infrared absorption changes at dentin tissue induced by the Er:YAG laser irradiation at 2.94 μm with sub-ablative energy densities. In this work it were used energy densities between 0.365 J/cm^2 and 1.94 J/cm^2 to irradiate 0.5mm slices of bovine dentin. For the infrared analysis a Fourier Transform Infrared spectrometer was used. The studied region was between 4000 cm^{-1} and 400cm^{-1} (2.5μm and 25μm). After the laser irradiation, two main changes were observed in the analyzed spectral region: loss of water and alteration in the structure of organic matrix. These alterations can be identified by intensity decrease of the water band between 3800cm^{-1} and 2800cm^{-1} and in those bands between 1400cm^{-1} and 1100cm^{-1}. Only a partial reversion of the water band pattern was observed after 24 hours of hydration, suggesting that erbium laser produces an irreversible alteration in the structure of the organic matrix when irradiated with energy densities bellow the ablation threshold.
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