

IN VIVO STUDY OF HOLMIUM LASER IRRADIATION ON DENTAL STRUCTURE

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Laser irradiation can increase dental resistance to acid, decreasing its demineralization. 20 samples obtained from bovine teeth were submitted to topical fluoride treatment and divided into four groups: a non-irradiated group, and G2,G3,G4 in which the fluoridated treatment were combined with different fluencies of an Ho:YLF laser prototype developed at ipen ($\lambda= 2,065\mu\text{m}$, 5Hz; $100\text{J}/\text{cm}^2$, $350\text{J}/\text{cm}^2$, $450\text{J}/\text{cm}^2$ respectively). Except for the control group, all enamel samples were submitted during 24 hours to fluoride treatment followed by demineralization. samples were analyzed by eds and scanning electron microscopy. In a second in vitro study, 20 rabbit teeth and 10 premolars human teeth were immersed in a thermal bath in order to verify temperature variations within pulpal chamber. G5 was submitted to irradiation at fluency of $350\text{J}/\text{cm}^2$ and G6 was submitted to $450\text{J}/\text{cm}^2$. An in vivo experiment was performed in order to test the pulpal safety of the irradiation protocol determined in the in vitro study with male adult rabbits. Animals were divided in two groups (A and B) on which each side of the jaw was irradiated with a density of energy: $300\text{J}/\text{cm}^2$ at the right side and $450\text{J}/\text{cm}^2$. At the first in vitro experiment, X-ray fluorescence spectrometry showed that the Ca/P contents does not vary before and after Ho:YLF irradiation with $100\text{J}/\text{cm}^2$, $350\text{J}/\text{cm}^2$, $450\text{J}/\text{cm}^2$ respectively. However this Ca/P content was significantly different from the control group (0.01%) to irradiated groups (1, 2 and 3). Surface alterations concerning caries prevention occurred at dentin level, and enamel showed a uniform fusion. There were less mineral loss IN G2, G3, G4 compared to non-irradiated group. After that, it was measured thermal variation ranging from 1°C to 4.5°C for proposed (G5,G6). According to literature, $\Delta T \leq 5.5^\circ\text{C}$ do not cause pulpal necrosis. For both groups A and B, at times 6, 24 and 72 hours did not show inflammatory cells at the pulpal tissue after irradiation. It was noted a lower demineralization and higher acid resistance of enamel surface when Ho:YLF laser irradiation is combined with high concentration fluoride treatment, compared to control. Fusion of enamel surface irradiated with Ho:YLF laser verified when irradiation was combined with high concentration fluoride treatment, increased resistance to acids. Thermal variations noted at in vivo experiment indicated that they would not cause damages in a future clinical trial. These results indicates that Ho:YLF irradiation combined with high concentration fluoride treatment is a promising alternative to clinical caries prevention.