

Demineralization of Dental Enamel Following Sub-Ablative CO₂ Laser Irradiation

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Purpose: The aim of this study was to investigate whether sub-ablative pulsed CO₂ laser irradiation is capable of reducing the susceptibility of the dental enamel to demineralization. There are just a few studies of caries prevention using 10.6 mm fluences lower than 1 J/cm². **Material and Methods:** 51 cubes of enamel obtained from bovine teeth were divided into three groups (n = 17): control group was not irradiated (CG); group laser A irradiated with 0.3 J/cm², 50 μs, 60 mJ, 100 Hz (LA), and group laser B irradiated with 0.7 J/cm², 100 μs, 135 mJ, 74 Hz (LB). The beam diameter at the site of the irradiations was 5 mm. After laser irradiation two samples of each group were submitted to SEM analysis and fifteen to demineralization in acetate buffer solution (0.1 M). The calcium and phosphorous content in the demineralization solution were measured with flame spectrometer. Two demineralized samples from each group were submitted to SEM analyses. **Results:** The ANOVA test showed statistical significant difference between the groups (p < 0.01) and the Tukey test at 1% significance level revealed that LB showed significantly lower means of Ca and P content in demineralization solution than other groups. SEM observations of the irradiated samples showed smooth surfaces, without signs of fusion or ablation. After demineralization the LB group showed mild surface dissolution and crystals with shape and size suggesting β-TCP apatites phase. **Conclusion:** The 0.7 J/cm², 100 ms pulsed CO₂ laser irradiation reduces enamel solubility without causing damage to the surface.