

Er,Cr:YSGG laser and fluoride for caries prevention: the influence on chemical composition and on resistance to demineralization of enamel and dentin

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This *in vitro* study evaluated the effect of Er,Cr:YSGG laser ($\lambda=2078$ nm) on enamel and dentin composition and their resistance to demineralization, when applied before or after professional acidulated fluoride gel application (APF-gel). Two hundred bovine enamel and dentin slabs were randomly distributed into ten groups: G1- untreated enamel; G2- enamel treated for 4 min with APF-gel (1.23% F⁻); G3- enamel irradiated with Er,Cr:YSGG laser (8.5 J/cm²); G4- preirradiated with Er,Cr:YSGG followed by APF-gel application; G5- pre-treated with APF-gel followed by Er,Cr:YSGG laser irradiation; G6- untreated dentin; G7- dentin treated with APFgel; G8- dentin irradiated with Er,Cr:YSGG laser (2.8 J/cm²); G9- dentin pre-irradiated with Er,Cr:YSGG followed by APF-gel application; G10- dentin pre-treated with APF-gel followed by Er,Cr:YSGG laser irradiation. After treatments, chemical composition was determined by ATR-FTIR (Attenuated total reflection - Fourier transformed infrared spectroscopy) at range of 4000-650 cm⁻¹ and resolution of 4 cm⁻¹. After that, all samples were submitted to a 10-day pHcycling model, and enamel and dentin resistance to demineralization was evaluated by crosssectional microhardness. Statistical analysis was performed by ANOVA/Tukey test ($\alpha=0.05$).

Laser irradiation decreased both carbonate and organic contents (amides I and II) of enamel and dentin when compared to untreated groups (G1 and G6), however the groups submitted to laser, combined or not with APF-gel application, did not differ among them. Enamel demineralization was reduced by laser irradiation on enamel ($p<0.05$), but this effect was not observed on dentin. Previous APF-gel application followed by laser irradiation (G5 and G9 groups) showed the highest reduction of enamel and dentin demineralization; however, the combination of laser and fluoride was not more efficient than their isolated effect. In conclusion, Er,Cr:YSGG laser changes the microstructure of enamel and dentin, and improves enamel and dentin resistance to demineralization when associated with fluoride, suggesting its anticaries potential.

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