Quantitative Microanalysis of Enamel Irradiated with Nd:YAG and Er,Cr:YSGG Laser

Zezell DM, Kauffman CM F, Ana PA, Blay A, Salvador VLR, Gomes AL
Centro de Lasers e Aplicações – IPEN/CNEN-SP, São Paulo, Brazil

The purpose of this study was to evaluate the calcium and phosphorous content of enamel after Nd:YAG and Er,Cr:YSGG irradiation for caries prevention. Fifty enamel blocks were prepared from non-carious, freshly extracted human molar teeth and randomly divided into six groups: (I) application of acidulated phosphate fluoride (APF); (II) Nd:YAG; (III) APF + Nd:YAG; (IV) Er,Cr:YSGG; (V) APF + Er,Cr:YSGG. Laser energy was measured by an energy meter before irradiating each sample by using a step motor. The Nd:YAG irradiation condition was 84.9 J/cm² (60 mJ/pulse, 300 µms spot size and 5Hz), while the Er,Cr:YSGG was 2.8 J/cm² (12.5 mJ/pulse 750 µms spot size, 20Hz). The APF gel (1.23% F-) was applied before laser irradiation in groups IV and VI during 4 minutes. Samples were submitted to an energy dispersive X-ray fluorescence spectrometric analysis, for quantitative microanalysis of calcium (Ca weight%) and phosphorous (P weight%) content, before and after treatments. The EDX-900HS provided a 1 mm diameter spot on the sample surface. Stoichiometric hydroxyapatite (NIST) was used as a standard during the measurements. Data were analyzed statistically by ANOVA ($p < 0.05$). The EDX spectrometric analysis revealed a significant increase in the Ca/P weight ratio in samples which APF was applied before Nd:YAG and Er,Cr:YSGG lasers. In contrast, no significant changes on Ca/P weight ratio was shown in lased samples without previous application of APF. These results suggest that Nd:YAG and Er,Cr:YSGG irradiation associated with APF can induce a crystallographic phase transformation of the irradiated enamel.
Acknowledgements: FAPESP, CAPES and SHIMADZU.