Spectroscopic and texture analysis by cone beam computed tomography of dentin modified with Nd:YAG laser

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Abstract

Objectives. The aim of this study was to evaluate the influence of the Nd:YAG laser associated or not associated with a new Curaprox black toothpaste-based photoabsorber on the chemical structure of dentin, through spectroscopic analysis (FTIR) and texture analysis by cone beam computed tomography (CBCT).

Materials and methods. Thirty specimens of bovine incisor crowns were obtained and embedded in acrylic resin. Each sample was ground and polished with sandpaper until the exposure of the dentin surface, followed by the demarcation of 2 circles on these surfaces using a 3-mm diameter trephine drill, one close to the incisal and the other close to the cervical region of the tooth, to establish regions separated in dentin for different interventions in the same specimen. From the demarcations, 4 groups were obtained (n = 15): GC – control group (no surface treatment), GL – laser group (Nd:YAG laser 60 mJ/pulse, 10 Hz, 48 J/cm^2, with contact and scanning for 60 s), GF – photoabsorber group (application of photoabsorber for 60 s, followed by abundant washing), GLF – photoabsorber group + laser (photoabsorber application + Nd:YAG laser 60 mJ/pulse, 10 Hz, 48 J/cm^2, with contact and sweep for 60 s). Afterwards, the samples were submitted to chemical analysis by means of FTIR, where the spectra with the transmittance peaks of the main elements were collected. The specimens were then submitted to a CBCT in order to analyze the texture parameters.

Results. Compared to the GC, in the GL there were changes in carbonate, phosphate and mainly amide groups. Regarding the GLF, the amide peaks were similar to the GL, but with differences in the phosphate and carbonate peaks. In the GF, there was an intermediate profile, with few changes. Meanwhile, in terms of texture, modified dentin showed significant difference among the groups in comparison to those not submitted to laser irradiation.

Conclusions. Laser irradiation promoted significant changes in chemical composition and texture of the substrate. However, the new associated photoabsorber was not able to potentiate the action of the Nd:YAG laser on dentin.