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Intra-pulpal and subsurface temperature rise during tooth irradiation with 808 nm diode laser: an in vitro study

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Abstract

Aim: This in vitro study evaluated the pulpal and subsurface temperatures during proximal tooth surface irradiation with different settings of an 808 nm diode laser.

Materials and methods: The elevation of pulpal and subsurface temperature during irradiation was measured using thermocouples positioned in the centre of the pulp chamber (n=30) and in the centre of a prepared 1.5 mm deep coronal cavity (n=30). Each sample was irradiated 3 times within one-week interval using different exposure settings. A temperature increase of 3.5°C was regarded as critical value for pulpal heath. Results were analysed with one-way ANOVA and Duncan post hoc tests. Micromorphological investigation by digital microscopy was carried out for the irradiated and non-irradiated tooth surface. RESULTS Measurable temperature increase within the pulp chamber (delta PT) and the subsurface (delta ST) were observed with all laser settings tested. The highest recorded delta PT and delta ST were 3.1°C and 8.5°C, respectively. Delivery mode, beam diameter, and exposure time influenced the temperature rise. No alterations on the enamel surface were observed when inspected by the digital microscope after undergoing irradiation with the tested parameters. Cconclusion: From the thermal point of view, under the conditions of the present study the application of an 808 nm diode laser on the outer surface of the tooth at 1W in the continuous mode and at 5W in the pulsed mode for two cycles of 30 s each proved to be safe.

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