Thermal Effects from Modified Endodontic Laser Tips Used in the Apical Third of Root Canals with Erbium-Doped Yttrium Aluminium Garnet and Erbium, Chromium–Doped Yttrium Scandium Gallium Garnet Lasers

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Abstract

Objective: To evaluate the temperature changes occurring on the apical third of root surfaces when erbium-doped yttrium aluminium garnet (Er:YAG) and erbium, chromium–doped yttrium scandium gallium garnet (Er,Cr:YSGG) laser energy was delivered with a tube etched, laterally emitting conical tip and a conventional bare design optical fiber tip. Background Data: Thermal effects of root canal laser treatments on periodontal ligament cells and alveolar bone are of concern in terms of safety. Materials and Methods: A total of 64 single-rooted extracted teeth were prepared 1 mm short of the working length using rotary nickel–titanium Pro-Taper files to an apical size corresponding to a F5 Pro-Taper instrument. A thermocouple located 2 mm from the apex was used to record temperature changes arising from delivery of laser energy through laterally emitting conical tips or plain tips, using an Er:YAG or Er,Cr:YSGG laser. Results: For the Er:YAG and Er,Cr:YSGG systems, conical fibers showed greater lateral emissions (452 ± 69% and 443 ± 64%) and corresponding lower forward emissions (48 ± 5% and 49 ± 5%) than conventional plain-fiber tips. All four combinations of laser system and fiber design elicited temperature increases less than 2.58°C during lasing. The use of water irrigation attenuated completely the thermal effects of individual lasing cycles. Conclusions: Laterally emitting conical fiber tips can be used safely under defined conditions for intracanal irradiation without harmful thermal effects on the periodontal apparatus.

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