A Histopathological Study of the Effect of Pulsed Nd:YAG Laser Irradiation on Infected Root Canals in Dogs

YUICHI KIMURA*, KENJI KOBA, KEIKO TAKAHASHI, EMI MATSUOKA and KOUKICHI MATSUMOTO
Department of Endodontics, Showa University School of Dentistry,
2-1-1 Kitasenzoku, Ohta-ku, Tokyo 145-8515, Japan

The effects of pulsed Nd:YAG laser irradiation during the root canal treatment of infected teeth were investigated histopathologically in dogs. One hundred eight teeth with a single root in 15 healthy adult beagle strain dogs were used in this study. After producing infected teeth, each root canal was shaped with up to at least #40 K-file, then canal was irradiated after coating with black ink using the following parameters: 1 W, 30pps, for 1 and 2 sec; 2 W, 30 pps, for 2sec. Efficacy of debris removal and evaporation on the root canal walls at 2 weeks, and the degree of inflammation of the periapical regions at 2, 4, and 8 weeks were examined histopathologically by light microscopy. Effective debris removal was observed in all cases of the laser-treated groups. Evaporation was observed in the laser –treated groups except at the conditions of 1 W for 1 sec. Inflammation of the periapical regions in the laser treated group (2W for 2 sec) was significantly less than that in the control group at 4 and 8 weeks ($p<0.05$). These results suggest that pulsed Nd:YAG laser is useful for the root canal treatment of infected teeth, if appropriate parameters are selected.

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Thermal Effects During *In Vitro* Intracanal Application of Er:YAG Laser

CECCHINI SCM*, ZEZELL DM, BACHMANN L, PINOTTI M, NOGUEIRA GEC, EDUARDO CP
São Paulo - Brazil

Lasers are being used for bacterial reduction and to modify the root canal surface. One concern for laser safety is that the heat produced at the irradiated root surface may cause damage to surrounding tooth supporting tissue. The purpose of this study was to determine the effect of laser treatment irradiation on temperature rise and the morphological related changes on root canal surface using thermocouple probe measurements and scanning electron microscopy, respectively. Single rooted extracted teeth were irradiated with the pulsed Er:YAG laser (2.94 μm) using a 375 μm diameter fiber optic probe placed at the root apex. Teeth were maintained in a 37°C water bath and temperature changes recorded as root canal was lased. Laser settings were 60 mJ or 120 mJ at the display (input), 40 mJ and 80 mJ, respectively measured at the fiber end (output) and repetition rate of 10 Hz. Teeth were not subjected to air or water cooling during the procedure. The root canals were irradiated for four periods with 20-second breaks in between, slowly moving the laser fiber from the apical to coronal surfaces in a continuous, circling fashion at 2mm/s. The range of 2.0 °C to 4.0 °C temperature rise was measured. Adequate laser parameters were determined to establish clinically safe levels of energy to deliver into the root canal.