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STUDENT SCHOLARSHIP

**Thermal Effects of Er,Cr:YSGG Laser Irradiation on External Root Surface
During Root Canal Treatment**

*Basem Salim (presenting), Alison Qualtrough, David Watts
The University of Manchester, Manchester, United Kingdom*

Aim of the Study

Heat generated in the root canal during laser irradiation will transfer to the root canal surface and may cause injury to adjacent periradicular and bone tissues. The objective of this study was to determine temperature-time profiles at *external* apical and coronal sites arising from outward heat transfer from *intraradicular* irradiation with different power settings of an Er,Cr:YSGG laser.

Materials and Methods

Crowns of anterior teeth were removed at the cemento-enamel junction. The working length of each root canal was established at 1 mm short of the apical foramen. Root canals were cleaned and shaped using a modified step-down technique and irrigation with 5.25% NaOCl. A size 40 file was used as a master apical file. The roots were irradiated by an Er,Cr:YSGG laser (2780-nm Waterlase, Biolase Technology, Irvine, Calif.) at a wavelength of 2.78 μm using power outputs of 0.75 W, 1 W, 1.5 W, 2 W, 3 W, and 5 W, with and without water cooling and repetition of 20 Hz for 8 sec using an endodontic fibre tip Z4 (400 μm). During the 8-sec irradiation, the tip was moved coronally. Temperature changes were recorded at *external apical* and *coronal* positions during irradiation using type K thermocouples. Transient temperature-time profiles were obtained using a high-speed PC data-acquisition system for 250 sec.

Results

The temperature did not increase more than 10° C on the external root surface during irradiation at all power output settings, except for 5 W without water cooling at the apical site, where $\Delta T > 10^\circ \text{C}$. In all cases the temperature rise apically and coronally, with and without water cooling, reached a peak in 4-6 sec, followed by exponential cooling down.

Conclusion

Thermal effects of Er,Cr:YSGG laser irradiation with water cooling during typical endodontic procedures have been shown to exhibit minimal damage potential to periradicular tissues *in vitro* and hence are expected to be safe for clinical use.

Biography: *Dr. Basem Salim graduated with a D.D.S. in 1994 from Tishreen University, Syria and with an MSc. in endodontics from Damascus University, Syria in 1999. Dr. Salim is a specialist in endodontics in Syria. Dr. Salim is currently a Ph.D. student at the School of Dentistry, The University of Manchester, studying the aspects of lasers in endodontics.*

Disclosure: *Dr. Salim has no commercial relationships relative to this presentation.*

Dr. Salim may be contacted by e-mail at basemso@hotmail.com.