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Original Research

# Relationship Between Surface Topography and Energy Density Distribution of Er,Cr:YSGG Beam on Irradiated Dentin: An Atomic Force Microscopy Study

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Published Online: 3 Apr 2011 |

<https://doi.org/10.1089/pho.2010.2812>



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**Abstract**

**Objective:** The aim of this study was to assess by atomic force microscopy (AFM) the effect of Er,Cr:YSGG laser application on the surface microtopography of radicular dentin. **Background:** Lasers have been used for various purposes in dentistry, where they are clinically effective when used in an appropriate manner. The Er,Cr:YSGG laser can be used for caries prevention when settings are below the ablation threshold. **Materials and Methods:** Four specimens of bovine dentin were irradiated using an Er,Cr:YSGG laser ( $\lambda = 2.78 \mu\text{m}$ ), at a repetition rate of 20 Hz, with a 750- $\mu\text{m}$ -diameter sapphire tip and energy density of  $2.8 \text{ J/cm}^2$  (12.5 mJ/pulse). After irradiation, surface topography was analyzed by AFM using a Si probe in tapping mode. Quantitative and qualitative information concerning the arithmetic average roughness ( $R_a$ ) and power spectral density analyses were obtained from central, intermediate, and peripheral areas of laser pulses and compared with data from nonirradiated samples. **Results:** Dentin  $R_a$  for different areas were as follows: central, 261.26 ( $\pm 21.65$ ) nm; intermediate, 83.48 ( $\pm 6.34$ ) nm; peripheral, 45.8 ( $\pm 13.47$ ) nm; and nonirradiated, 35.18 ( $\pm 2.9$ ) nm. The central region of laser pulses presented higher ablation of intertubular dentin, with about 340–760 nm height, while intermediate, peripheral, and nonirradiated regions presented no difference in height of peritubular and interperitubular dentin. **Conclusion:** According to these results, we can assume that even when used at a low-energy density parameter, Er,Cr:YSGG laser can significantly alter the microtopography of radicular dentin, which is an important characteristic to be considered when laser is used for clinical applications.

