



**Academy of Laser Dentistry**  
**Source 2007: Lasers in Dentistry**  
**Nashville, Tennessee**

**Friday, March 30, 2007**

**9:35 AM – 9:50 AM**

**STUDENT SCHOLARSHIP**

**Cleaning and Shaping of Root Canal Systems Using Erbium Lasers – Two-Dimensional Change and Surface Characteristics from Erbium Lasers Used for Root Canal Preparation as Compared to Rotary Instrumentation**

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**Aim of the Study**

This study evaluated the ability of Er:YAG lasers to remove dentin in the root canal system in a timely and predictable fashion and to evaluate the lasers' cleaning ability.

**Material and Methods**

The study examined two groups of 14 teeth. Teeth from each group underwent different instrumentation and irrigation solutions. The protocol for cleaning and shaping involved either rotary instrumentation with 2.5% sodium hypochlorite and a 30-second EDTA rinse or the Er:YAG laser (DELIGHT, Hoya ConBio, San Jose, Calif.) with distilled water irrigation. Specific laser parameters (wavelength 2.94 micrometers, 400-msec pulse duration, 20 Hz repetition rate and 250 mJ energy per pulse) were chosen and applied within the root canal system for three locations: coronal, middle, and apical thirds. The laser group was prepared with microprobes 200 to 400 micrometers in diameter and 31 mm in length attached to special delivery handpieces. The amount of dentin removed was measured in two dimensions at nine points from the apex. Results were analyzed using ANOVA. All of the procedures were timed for comparison. A separate group of three teeth were evaluated for cleaning effects using an Er:YAG laser with specially designed spiral tips. The amount of surface debris remaining was examined using scanning electron microscopy.

**Results**

The Er:YAG laser removed significantly more dentin in the coronal third compared to the rotary files. However, the rotary files removed significantly more dentin in the mid and apical thirds. Analysis by two-way ANOVA demonstrated significant differences at all three levels ( $p < 0.05$ ). Analysis using post hoc tests within the respective groups showed a significant amount of dentin removed by both techniques ( $p < 0.05$ ) (GT rotary files and laser) at all three levels. When time of preparation was examined, the laser group required significantly longer preparation than the GT rotary file group ( $p < 0.05$ ). On average, the laser group took almost twice as long as the conventional method. Rotary instrumentation showed less debris compared with either of the laser protocols.

**Conclusions**

The control group produced cleaner, more ideal-shaped root canals in less time than the Er:YAG

laser group. The Er:YAG laser with Spiral Tip group left a dense smear layer in the mid and apical thirds. The coronal portion did not appear as clean as the control group.

**Biography:** *Dr. Roper completed a Master of Science degree in Oral and Craniofacial biology in addition to a Certificate in Advanced Graduate Study in Endodontics at the University of California at San Francisco (UCSF) School of Dentistry. He is also currently on the clinical faculty at UCSF in the Department of Endodontics as well in private practice in San Rafael and Novato, California.*

**Disclosure:** *Dr. Roper is a Clinical Faculty, Department of Preventive and Restorative Dental Sciences, Endodontics, UCSF School of Dentistry.*

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