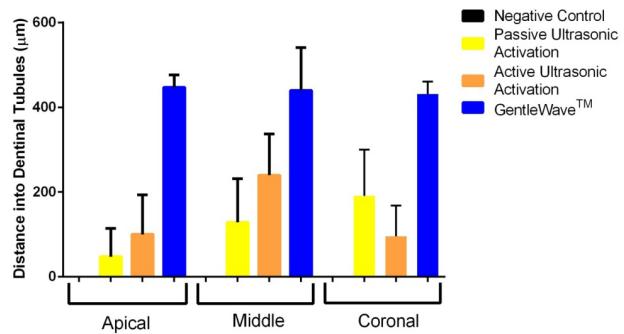


Using the GentleWave® System to Assess Penetration Depth of Irrigation Fluids into Dentinal Tubules

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INTRODUCTION

The intent of endodontic therapy is to rid the root canal system of microbial infection, yet infection does not only affect the main root canal system but the dentin tubules as well. Bacterial penetration to about 300 μ m and chemical signals (endotoxins) from bacteria can penetrate approximately 300-500 μ m. This makes instrumentation and irrigation crucial steps in endodontic therapy. While sodium hypochlorite (NaOCl) is the most common irrigation fluid due to its ability to eliminate tissue remnants and microbial biofilms, there are not many studies about the penetration depths of NaOCl into dentinal tubules. In this study, the GentleWave® System is compared to ultrasonic agitation when assessing penetration depths of irrigation fluids into dentinal tubules.



MATERIALS & METHODS

The initial step in the study was accessing and instrumenting 40 extracted human molars to size #15/.04. From there, they were disinfected in an effort to eliminate pulp tissue, placed in crystal violet dye and incubated (37°C) overnight. The next day, the molars were rinsed under tap water for 30 minutes and separated randomly into four groups (10 molars in each group), with NaOCl being the irrigation fluid:

- Group 1: Control group (no treatment)
- Group 2: Passive ultrasonic activation using PiezonMaster™ 700 (EMS) with ESI tip
- Group 3: Active ultrasonic activation using PiezonMaster™ 700 with ESI tip with maximum irrigation rate
- Group 4: The GentleWave System

After each group underwent the group's designated procedure, the molars were rinsed with an air/water syringe for 60 seconds. After the rinse, the teeth were split from a longitude aspect of which only 80% of teeth samples were free of cutting artifacts. The mesiobuccal and distobuccal aspects of the maxillary molar samples and the mesial aspect of the mandibular molars (74 root halves) were assessed. Nikon® stereo microscope and software were

used to image and evaluate to the NaOCl penetration depth measurement into dentinal tubules. Welch's t-test was the statistical analysis implemented in the study. To determine the degree of dependence between the distance from the apex and the depth of NaOCl penetration, Pearson correlation coefficients (r) were calculated.

RESULTS

The GentleWave System group, when compared to the passive and active ultrasonic irrigation groups, was significantly different ($p<0.05$) for the apical aspect of the molar canals. There was no significant difference between the passive and active ultrasonic irrigation groups ($p>0.05$).

CONCLUSION

The average penetration depth achieved using the GentleWave System was $447.4 \pm 76.5\mu\text{m}$. The GentleWave System revealed a NaOCl penetration depth 4 times deeper in the apical region of the root, compared to the active ultrasonic irrigation and 8.5 times deeper than passive ultrasonic irrigation.

Learn more about the GentleWave® System at GentleWave.com/Doctor



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