

Reviews of Four Independent Clinical Studies Focusing on Continuous Ultrasonic Irrigation Protocols

by John Nusstein, DDS, MS
Division of Endodontics, The Ohio State University

The In Vivo Evaluation of Hand/Rotary/Ultrasound Instrumentation in Necrotic, Human Mandibular Molars¹

The efficacy of biofilm/necrotic debris debridement utilizing two techniques was histologically compared in this in vivo, prospective, randomized, single-blind study conducted on the mesial roots of human, necrotic mandibular molars. One group of 20 mesial roots received hand/rotary instrumentation, while the second group of 20 mesial roots underwent a technique that combined hand/rotary instrumentation with 1 minute of ultrasonic irrigation per canal utilizing an ultrasonic irrigating needle. After extraction, histologic preparation and staining, cross sections were evaluated every 0.2 mm. The group that received the one-minute of ultrasonic irrigation following hand/rotary root canal cleaning and shaping was shown to have significantly better canal cleanliness (95%, 99% and 100%, respectively) and isthmus cleanliness (83%, 86% and 91%, respectively) compared to the group that received hand/rotary instrumentation alone (80%, 92% and 95%, respectively, for canals; 33%, 31% and 45%, respectively, for isthmuses) at the 1.0, 2.0 and 3.0 mm levels.

In Vivo Debridement Efficacy of Ultrasonic Irrigation Following Hand-Rotary Instrumentation in Human Mandibular Molars²

This in vivo, prospective, randomized, single-blind study histologically compared the debridement efficacy in the mesial roots of human mandibular molars with a hand/rotary cleaning and shaping technique versus hand/rotary cleaning and shaping followed by an ultrasonic irrigation technique. One group of 16 teeth received hand/rotary cleaning and shaping with no ultrasonic irrigation. A second group of 15 teeth was prepared with the same technique, immediately followed by 1 minute of ultrasonic irrigation per canal. A third histologic control group comprised five uninstrumented mandibular molars. Cross-sections every 0.2 mm from the 1- to 3-mm apical levels were prepared and stained following extraction and histologic preparation. Tissue removal was calculated in both groups, showing the addition of ultrasonic irrigation significantly improved both canal and isthmus cleanliness at all apical levels but one.

In Vivo Antibacterial Efficacy of Ultrasound after Hand and Rotary Instrumentation in Human Mandibular Molars³

This in vivo, prospective, randomized, single-blind study compared the antibacterial efficacy of a hand/rotary instrumentation technique with hand/rotary instrumentation plus one minute of ultrasonic irrigation in the mesial roots of infected, necrotic mandibular molars. One group of 16 teeth was prepared with manual hand-file/rotary instrumentation cleaning and shaping with no ultrasonic irrigation. A second group of 15 teeth was prepared with the same technique followed by 1 minute of ultrasonic irrigation per canal utilizing 6.0% NaOCl. Bacterial samplings were taken before and after hand/rotary instrumentation of all mesial canals and in the mesial canals of Group 2 teeth post-ultrasonic irrigation. Samples were incubated anaerobically for one week and tested for bacterial growth. Hand/rotary instrumentation was shown to significantly reduce bacteria from initial counts in both groups ($p = .0047$). When ultrasonic irrigation was added to the process, a more significant reduction in bacterial counts occurred ($p = .0006$) and was 7 times more likely to yield a negative culture than with hand/rotary instrumentation alone.

In Vivo Evaluation of Intraoperative and Postoperative Pain of a Hand/Rotary/Ultrasound Technique in the Root Canals of Vital and Necrotic Teeth⁴

Previous studies have shown ultrasound irrigation to be an effective endodontic cleaning technique when combined with hand/rotary instrumentation cleaning and shaping. However, no studies have yet evaluated the intraoperative and postoperative pain associated with ultrasound techniques. This in vivo, prospective, randomized, single-blind study compared the intraoperative and postoperative pain in teeth with vital and necrotic pulps when receiving hand/rotary instrumentation alone versus hand/rotary instrumentation plus ultrasonic irrigation. One group of subjects received hand/rotary instrumentation and mock ultrasonic irrigation, while a second group received hand/rotary instrumentation followed by actual ultrasonic irrigation with a 6.0% sodium hypochlorite solution. Subjects completed intraoperative and 3-day postoperative pain surveys. No sodium hypochlorite accidents were reported with the ultrasonic irrigation group. Intraoperative pain was reported as mild for both the mock and active ultrasonic groups. In both groups, postoperative pain decreased over the 3 days from moderate to mild. Because no significant differences in pain were reported, this study indicates that ultrasonic irrigation post-hand/rotary instrumentation is safe when used in the root canals of teeth with vital, necrotic pulps.

¹Burleson A, Nusstein J, Reader A, Beck M. *The In Vivo Evaluation of Hand/Rotary/Ultrasound Instrumentation in Necrotic, Human Mandibular Molars. Journal of Endodontics 2007;33(7):782-7*

²Gutarts R, Nusstein J, Reader A, Beck M. *In Vivo Debridement Efficacy of Ultrasonic Irrigation Following Hand-Rotary Instrumentation in Human Mandibular Molars. Journal of Endodontics 2005;31(3):166-70*

³Carver K, Nusstein J, Reader A, Beck M. *In Vivo Antibacterial Efficacy of Ultrasound after Hand and Rotary Instrumentation in Human Mandibular Molars. Journal of Endodontics 2007;33(9):1038-43*

⁴Pafford J, Nusstein J, Reader A, Beck M, Drum M. *In Vivo Evaluation of Intraoperative and Postoperative Pain of a Hand/Rotary/Ultrasound Technique in the Root Canals of Vital and Necrotic Teeth. Journal of Endodontics 2008;34(3):350*

DENTSPLY
TULSA DENTAL
SPECIALTIES

Endodontics & Implants

*Our Quality. Your Success.
Their Satisfaction.*

DENTSPLY Tulsa Dental Specialties

DENTSPLY International, Inc.
5100 E. Skelly Drive, Suite 300
Tulsa, OK 74135
1-800-662-1202
1-800-597-2779 (fax)

www.tulsadentalspecialties.com