

Ausgabe: Endodontie Journal 3/2016

Thema: Laseraktivierte Spülung mit PIPS® – die Macht der besseren Spülung

Autor: Dr. Ralf Schlichting

Literatur

1. Siqueira JF Jr. Endodontic Infections: concepts, paradigms and perspectives. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;94:281-93.
2. Langeland K, Dowden WE, Tronstad L, Langeland LK: Human Pulp changes of iatrogenic origin. *Oral Surg* 32:943, 1971.
3. Figor D, Sundqvist G: A big role for the very small – understanding the endodontic microbial flora. *Aust Dent J.* 2007 Mar;52:38-51.
4. Rochas IN, Hülsmann M, Siqueira J jr: Microorganisms in root – canal treated teeth from a german population: JOE AUG 2008.
5. Blome B, Braun A, Sobarzo V, Jepsen S: Molecular identification and quantification of bacteria from endodontic infections using real-time polymerase chain reaction. *Oral Microbiol Immunol.* 2008 Oct.
6. Siqueira JF Jr., Alves F, Rochas I, Antunes H: Total and Specific Bacterial levels in the Apical Root Canal System of teeth with post treatment apical periodontitis. *J Endod* 2015;41; 1037-1042.
7. Siqueira J, Rochas I, Lopes H: Patterns of microbial colonization in primary root canal infection. *Oral Surg Oral Med Oral Path Oral Radio Endod* 2002;93:174-8.
8. Haapasalo, M. and Ørstavik, D. In vitro infection and disinfection of dentinal tubules. *J Dent Res.* 1987; 66: 1375–1379.
9. Nair PNR: Light and electron microscopic studies of root canal flora and periapical lesions. *Journal of Endodontics* 13: 121-48; 1987.
10. Costerton JW, Veeh R, Shirtcliff M, Pasmore M, Post C: The application of biofilm science to the study and control of chronic bacteria infections. *Journal of Clinical Investigations* 112, 1466-77; 2003.
11. Wilson M: Susceptibility of oral bacterial biofilms to antimicrobial agents. *Journal of Medical Microbiology* 44:79-87; 1996.
12. Ricucci D, Siqueira JF, Jr: Biofilms and apical periodontitis: study of prevalence and association with clinical and histopathologic findings. *J Endod* 2010; 36:1277-1288.
13. Siqueira JF Jr. Endodontic Infections: concepts, paradigms and perspectives. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;94:281-93.
14. Dalton BC, Orstavik d, Philips C, Pettiette M, Trope M. Bacterial reduction with nickel-titanium rotary instrumentation. *J Endod* 1998;24:763-767.
15. Clark D, Khademi J. Modern molar endodontic access and directed dentin conservation. *Dent Clin North Am* 2010; 54:249-273.
16. Eva Katia Stöber, DDS, MsC, Joan de Ribot, DDS, MsC, Montse Mercadé, DDS, PhD, Jorge Vera, DDS, PhD, Rufino Bueno, DDS, PhD, Miguel Roig, DDS, PhD, Fernando Duran-Sindreu, DDS, PhD: Evaluation of the Raypex 5 and the Mini Apex Locator: An In Vivo Study. *J Endod* (10): 1349-52; 2011.
17. Siqueira JF Jr. Endodontic Infections: concepts, paradigms and perspectives. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;94:281-93.
18. Peters OA, Schönenberger K, Laib A: Effects of four Ni-Ti preparation techniques on root canal geometry assessed by micro computed tomography. *Int Endod J.* 2001 Apr;34(3):221-30).
19. Sjögren U, Hägglund B, Sundqvist G, Wing K: Factors affecting the long term results of endodontic treatment. *Journal of Endodontics;* 1990(16): 498-504.
20. Sonntag D, Guntermann A, Kim SK, Stachniss V.. Department of Operative Dentistry, Philipps University, Marburg, Germany: Root canal shaping with manual stainless steel files and rotary Ni-Ti files performed by students. *Int Endod J.* 2003 Apr;36(4):246-55.

21. Pedulia E, Grande N, Plotino G, Gambarini G, Rapisarda E: Influence of continuous or reciprocating motion on cyclic fatigue resistance of four different nickel titanium instruments. *J Endod* (39): 258-63; 2013.
22. Bürklein S, Hinschitza K, Dammaschke T, Schäfer E. Shaping ability and cleaning effectiveness of two single-file systems in severely curved root canals of extracted teeth: Reciproc and WaveOne versus Mtwo and ProTaper. *Int Endod J* 2011(Dec).
23. Zehnder M. Root canal irrigants. *J Endod*. 2006;32:389–398.
24. Peters CA, Barbakow F. Effect of irrigation on debris and smear layer on canal walls prepared by two rotary techniques: a scanning electron microscopic study. *J Endod*. 2000;25:6–10.
25. Örstavik D, Haapasalo M. Disinfection by endodontic irrigants and dressings of experimentally infected dentinal tubules. *Endod Dent Traumatol*. 1990;6:142–149.
26. Sjögren U, Hägglund B, Sundqvist G, Wing K: Factors affecting the long term results of endodontic treatment. *Journal of Endodontics*; 1990(16): 498-504.
27. Bystroem A, Sundqvist G: Bacteriologic evaluation of the effect of 0,5 percent sodium hypochlorite in endodontic therapy. *Oral Surg* 1983;55:307-11.
28. Naenni N, Thoma K, Zehnder M: Soft tissue dissolution capacity of currently used and potential endodontic irrigants. *J Endod* 2004;30:785-787.
29. Zehnder M, Kosicki D, Luder H, Sener B, Waltimo T: Tissue-dissolving capacity and antibacterial effect of buffered and unbuffered hypochlorite solutions. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;94:756-62.
30. Sedgley CM, Applegate B, Nagel AC, Hall D: Real-time imaging and quantification of bioluminescent bacteria in root canals in vitro. *J Endod* 2004;30:893-98.
31. Sirtes G, Waltimo T, Schaetzle M, Zehnder M: The effects of temperature on sodium hypochlorite short-term stability, pulp dissolution capacity and antimicrobial efficacy. *J Endod* 2005;31:669-71.
32. Gomes BP, Ferraz CC, Vianna ME, Berber VB, Texeira FB, Souza-Filho FJ: In vitro antimicrobial activity of several concentrations of sodium hypochlorite and chlorhexidine gluconate in the elimination of *Enterococcus faecalis*. *Int Endod J* 2001;34:424-28.
33. Mayer BE, Peters OA, Barbakow F: Effects of rotary instruments and ultrasonic irrigation on debris and „Smear layer“ scores: a scanning electron microscopic study. *Int Endod J* 2002;35:582-89.
34. Fidalgo TK, Barcelos R, Portela MB, Soares RM, Gleiser R, Silva-Filho FC.: Inhibitory activity of root canal irrigants against *Candida albicans*, *Enterococcus faecalis* and *Staphylococcus aureus*. *Braz Oral Res*. 2010 Oct-Dec;24(4):406-12.
35. Siqueira, J.F. Jr., Batista, M.M., Fraga, R.C., and de Uzeda, M. Antibacterial effects of endodontic irrigants on black-pigmented gram-negative anaerobes and facultative bacteria. *J Endod*. 1998; 24: 414–416.
36. Zakariassen KL, Dederich DN, Tulip J, DeCoste S, Jensen SE, Pickard MA. Bacterial action of carbon dioxide laser radiation in experimental dental root canals. *Can J Microbiol* 1986;32(12): 942-46.
37. Pirnat S, Lukac M, Ihan A. Study of the direct bactericidal effect of Nd:YAG and diode laser parameters used in endodontics on pigmented and nonpigmented bacteria. *Lasers Med Sci*. 2011 26: 755-61.
38. Coluzzi D: Fundamentals of Lasers in Dentistry: Basic Science, Tissue interaction and Instrumentation. *J Laser Dent* 2008;16:4-10.
39. Dederich DN, Zakariassen KL, Tulip J (1984) Scanning electron microscopic analysis of canal wall dentin following neodymium- yttrium-aluminum-garnet laser irradiation. *J Endod* 10:428-431.
40. Klinke T, Klimm W, Gutknecht N (1997) Antibacterial effects of Nd:YAG laser irradiation within root canal dentin. *J Clin Laser Med Surg* 15:29-31.
41. Orstavik D, Haapasalo M (1990) Disinfection by endodontic irrigants and dressings of experimentally infected dentinal tubules. *Endod Dent Traumatol* 6:142-149.
42. Yasuda Y, Kawamorita T, Yamaguchi H, Saito T (2010) Bactericidal effect of Nd:YAG and Er:YAG lasers in experimentally infected curved root canals. *Photomed Laser Surg* 28 Suppl 2:S75-8.

43. Behrens V, Gutknecht N, Reuziehausen R, Lampert F (1993) Die Transmission und Absorption der Temperatur und Energie des Nd-YAG-lasers im Dentin. ZWR 102:629-634.
44. Matsumoto H, Yoshimine Y, Akamine A (2011) Visualization of Irrigant Flow and Cavitation Induced by Er:YAG Laser within a Root Canal Model. J Endod 37:839-843.
45. DeMoore R., Meire M.: REVIEW: High-Power Lasers in Endodontics - Fiber Placement for Laser-Enhanced Endodontics: in the Canal or at the Orifice? Journal of the Laser and Health Academy Vol. 2014, No.1.
46. Meire M, De Moor RJG (2007) Lasers in endodontics: laser disinfection, an added value? ENDO 3, 159-172.
47. De Moor RJG, Torbevens D, Meire M (2009) Lasers in endodontics. Part 2: Root canal wall cleanliness and modification. ENDO 3, 19- 33.
48. Takeda FH, Harashima T, Kimura Y, et al (1999) A comparative study of removal of smear layer by three endodontic irrigants and two types of laser. Int Endod J 32:32-39.
49. Vergauwen TE, Michiels R, Torbevens D, Meire M, De Bruyne M, De Moor RJ (2014) Investigation of Coronal Leakage of Root Fillings after Smear Layer Removal with EDTA or Er,Cr:YSGG Laser through Capillary Flow Porometry. Int J Dent 2014:593160.
50. Biedma BM, Patino PV, Park SA, et al. (2005) Comparative study of root canals instrumented manually and mechanically, with and without Er:YAG laser. Photomed Laser Surg 23:465-469.
51. Stabholz A, Zeltser R, Sela M, Peretz B, Moshonov J, Ziskind D, Stabholz A (2003)The use of lasers in dentistry: principles of operation and clinical applications. Compend Contin Educ Dent. 24:935-948.
52. Blanken JW, Verdaasdonk RM (2007) Cavitation as a working mechanism of the Er,Cr:YSGG laser in endodontics: a visualization study. J Oral Laser Appl 7:97–106.
53. Blanken JW, De Moor RJG, Meire M, Verdaasdonk RM (2009) Laser induced explosive vapor and cavitation resulting in effective irrigation of the root canal: part 1—a visualization study. Lasers Surg Med 41:514–519.
54. George R, Meyers IA, Walsh LJ (2008) Laser activation of endodontic irrigants with improved conical laser fiber tips for removing smear layer in the apical third of the root canal. J Endod 34:1524-1527.
55. George R, Meyers IA, Walsh LJ (2008) Laser activation of endodontic irrigants with improved conical laser fiber tips for removing smear layer in the apical third of the root canal. J Endod 34:1524-1527.
56. Blanken JW, Verdaasdonk RM (2007) Cavitation as a working mechanism of the Er,Cr:YSGG laser in endodontics: a visualization study. J Oral Laser Appl 7:97–106.
57. DiVito E, Peters OA, Olivi G (2012) Effectiveness of the erbium:YAG laser and new design radial and stripped tips in removing the smear layer after root canal instrumentation. Lasers Med Sci 27:273-280.
58. Peters OA, Bardsley S, Fong J, Pandher G, Divito E (2011) Disinfection of root canals with photon-initiated photoacoustic streaming. J Endod 37:1008-1012.
59. Peeters HH, Mooduto L (2013) Radiographic examination of apical extrusion of root canal irrigants during cavitation induced by Er,Cr:YSGG laser irradiation: an in vivo study. Clin Oral Invest 17:2105-2012.
60. Blanken J, De Moor RJG, Meire M, Verdaasdonk RM. Laser induced explosive vapour and cavitation resulting in effective irrigation of the root canal. Part 1: A visualization study. Lasers Surg Med 2009;41:514-519.
61. Matsumoto H, Yoshimine Y, Akamine A. Visualization of Irrigant Flow and Cavitation Induced by Er:YAG Laser within a root canal model. J Endod 2011;37:839-843.
62. Brennen CE. Cavitation and bubble dynamics. 1995. Oxford University Press, New York.
63. Meire MA, Poelman D, De Moor RJ. Optical properties of root canal irrigants in the 300-3,000-nm wavelength region. Lasers Med Sci. 2013 Mar 27. [Epub ahead of print]
64. Olivi G. Laser use in endodontics: evolution from direct laser irradiation to laser-activated irrigation. J Laser Dent. 2013;21:58-71.
65. DiVito E, Peters OA, Olivi G. Effectiveness of the erbium:YAG laser and new design radial and stripped tips in removing the smear layer after root canal instrumentation. Lasers Med Sci. 2012; 27:273-280.

66. Peters O, Bardsley S, Fong J: Disinfection of root canals with Photon-initiated Photoacoustic Streaming. *J Endod* 2011;37:1008-10012.
67. Jaramillo D, Ordinola-Zapata R, Bramante CM, Di Vito E: Biofilm removal by 6% sodium hypochlorite activated by different irrigation techniques, *Int Endod J*, 2014;47: 659-66.
68. Arslan H, Akcay M, Capar I.D.: An in vitro comparison of irrigation using photon-initiated photoacoustic streaming, ultrasonic, sonic and needle techniques in removing calcium hydroxide, *Int End J* 2015;48: 246-51.
69. Jaramillo D, Aprecyo R, Angelov N, Efficacy of photon-induced photoacoustic streaming (PIPS) on root canals infected with *Enterococcus faecalis*: Apilot Study, *Endod Prac* 2012;5:28-32.