



UNIVERSITAT DE BARCELONA



Facultat d'Odontologia
Universitat de Barcelona
Departament d'Odontoestomatologia

TESIS DOCTORAL

**Estudio comparativo entre
las fuerzas de adhesión
obtenidas sobre dentina
preparada con instrumental
rotatorio y láser de
Er,Cr:YSGG**

Antonio Jesús España Tost

Codirectores: Prof. Dr. Leonardo Berini Aytés
Prof. Dr. Enric Espasa Suárez de Deza

9.- BIBLIOGRAFÍA

1. Buonocore MG. A simple method of increasing the adhesion of acrylic filling materials to enamel surfaces. *J Dent Res* 1955;34:849-53.
2. Kanca JT, Sandrik J. Bonding to dentin. Clues to the mechanism of adhesion. *Am J Dent* 1998;11:154-9.
3. Gutknecht N, Eduardo CDP. *A Odontologia e o Laser*. Sao Paolo: Quintessence Editora Ltda.; 2004.
4. Miserendino L, Pick R. *Lasers in Dentistry*. Chicago: Quintessence Publishing; 1995.
5. Hibst R, Keller U. Experimental studies of the application of the Er:YAG laser on dental hard substances: I. Measurement of the ablation rate. *Lasers Surg Med* 1989;9:338-44.
6. Keller U, Hibst R. Experimental studies of the application of the Er:YAG laser on dental hard substances: II. Light microscopic and SEM investigations. *Lasers Surg Med* 1989;9:345-51.
7. Eversole LR, Rizoiu IM. Preliminary investigations on the utility of an erbium, chromium YSGG laser. *J Calif Dent Assoc* 1995;23:41-7.
8. España Tost AJ, Velasco Vivancos V, Gay Escoda C, Berini Aytés L, Arnabat Domínguez J. *Aplicaciones del láser de CO₂ en Odontología*. Madrid: Ergon; 1995.
9. Rauhamaa-Makinen R, Meurman JH, Luomanen M, Torkko H, Viherkoski E, Paunio I. Irradiation of human dental tissues with CO₂-, Nd:YAG-, and CO₂-Nd:YAG combination laser. *Scand J Dent Res* 1991;99:470-5.

10. Tokonabe H, Kouji R, Watanabe H, Nakamura Y, Matsumoto K. Morphological changes of human teeth with Er:YAG laser irradiation. *J Clin Laser Med Surg* 1999;17:7-12.
11. Hossain M, Nakamura Y, Yamada Y, Suzuki N, Murakami Y, Matsumoto K. Analysis of surface roughness of enamel and dentin after Er,Cr:YSGG laser irradiation. *J Clin Laser Med Surg* 2001;19:297-303.
12. Apel C, Schafer C, Gutknecht N. Demineralization of Er:YAG and Er,Cr:YSGG laser-prepared enamel cavities in vitro. *Caries Res* 2003;37:34-7.
13. Harashima T, Kinoshita J, Kimura Y, Brugnera A, Zanin F, Pecora JD, Matsumoto K. Morphological comparative study on ablation of dental hard tissues at cavity preparation by Er:YAG and Er,Cr:YSGG lasers. *Photomed Laser Surg* 2005;23:52-5.
14. Nakabayashi N, Nakamura M, Yasuda N. Hybrid layer as a dentin-bonding mechanism. *J Esthet Dent* 1991;3:133-8.
15. Chappell RP, Cobb CM, Spencer P, Eick JD. Dentinal tubule anastomosis: a potential factor in adhesive bonding? *J Prosthet Dent* 1994;72:183-8.
16. Shinchi MJ, Soma K, Nakabayashi N. The effect of phosphoric acid concentration on resin tag length and bond strength of a photo-cured resin to acid-etched enamel. *Dent Mater* 2000;16:324-9.
17. Al-Salehi SK, Burke FJ. Methods used in dentin bonding tests: an analysis of 50 investigations on bond strength. *Quintessence Int* 1997;28:717-23.

18. España Tost AJ, Arnabat Domínguez J, Berini Aytés L, Gay Escoda C. Aplicaciones del láser en Odontología. RCOE 2004;9:497-511.
19. Stabholz A, Zeltser R, Sela M, Peretz B, Moshonov J, Ziskind D, Stabholz A. The use of lasers in dentistry: principles of operation and clinical applications. *Compend Contin Educ Dent* 2003;24:935-48; quiz 49.
20. Brugnera A, Pinheiro AL. *Lasers na odontologia moderna*. Sao Paulo: Pancast; 1998.
21. Guinot Moya R, España Tost AJ, Berini Aytés L, Gay Escoda C. Utilización de otros láseres en Odontología: Argón, Nd:YAP y Ho:YAG. RCOE 2004;9:581-6.
22. Martelli FS, De Leo A, Zinno S. *Laser in odontostomatologia*. Milano: Masson S.p.A.; 2000.
23. Larrea Oyarbide N, España Tost AJ, Berini Aytés L, Gay Escoda C. Aplicaciones del láser de diodo en Odontología. RCOE 2004;9:529-34.
24. Zavaleta De La Huerta D, España Tost AJ, Berini Aytés L, Gay Escoda C. Aplicaciones del láser de Nd:YAG en Odontología. RCOE 2004;9:539-45.
25. Kinoshita J, Kimura Y, Matsumoto K. Comparative study of carious dentin removal by Er,Cr:YSGG laser and Carisolv. *J Clin Laser Med Surg* 2003;21:307-15.
26. Attrill DC, Davies RM, King TA, Dickinson MR, Blinkhorn AS. Thermal effects of the Er:YAG laser on a simulated dental pulp: a quantitative evaluation of the effects of a water spray. *J Dent* 2004;32:35-40.

27. Cavalcanti BN, Lage-Marques JL, Rode SM. Pulpal temperature increases with Er:YAG laser and high-speed handpieces. *J Prosthet Dent* 2003;90:447-51.
28. Lee BS, Hsieh TT, Lee YL, Lan WH, Hsu YJ, Wen PH, Lin CP. Bond strengths of orthodontic bracket after acid-etched, Er:YAG laser-irradiated and combined treatment on enamel surface. *Angle Orthod* 2003;73:565-70.
29. Usumez S, Orhan M, Usumez A. Laser etching of enamel for direct bonding with an Er,Cr:YSGG hydrokinetic laser system. *Am J Orthod Dentofacial Orthop* 2002;122:649-56.
30. Gow AM, McDonald AV, Pearson GJ, Setchell DJ. An in vitro investigation of the temperature rises produced in dentine by Nd:YAG laser light with and without water cooling. *Eur J Prosthodont Restor Dent* 1999;7:71-7.
31. Malmstrom HS, McCormack SM, Fried D, Featherstone JD. Effect of CO₂ laser on pulpal temperature and surface morphology: an in vitro study. *J Dent* 2001;29:521-9.
32. Melcer J, Chaumette MT, Melcer F, Dejardin J, Hasson R, Merard R, Pinaudeau Y, Weill R. Treatment of dental decay by CO₂ laser beam: preliminary results. *Lasers Surg Med* 1984;4:311-21.
33. Keller U, Hibst R, Geurtsen W, Schilke R, Heidemann D, Klaiber B, Raab WH. Erbium:YAG laser application in caries therapy. Evaluation of patient perception and acceptance. *J Dent* 1998;26:649-56.
34. Jacobson B, Berger J, Kravitz R, Ko J. Laser pediatric Class II composites utilizing no anesthesia. *J Clin Pediatr Dent* 2004;28:99-101.

35. Shigetani Y, Tate Y, Okamoto A, Iwaku M, Abu-Bakr N. A study of cavity preparation by Er:YAG laser. Effects on the marginal leakage of composite resin restoration. *Dent Mater J* 2002;21:238-49.
36. Ceballos L, Camejo DG, Victoria Fuentes M, Osorio R, Toledano M, Carvalho RM, Pashley DH. Microtensile bond strength of total-etch and self-etching adhesives to caries-affected dentine. *J Dent* 2003;31:469-77.
37. Kato J, Moriya K, Jayawardena JA, Wijeyeweera RL, Awazu K. Prevention of dental caries in partially erupted permanent teeth with a CO₂ laser. *J Clin Laser Med Surg* 2003;21:369-74.
38. Kimura Y, Wilder-Smith P, Yonaga K, Matsumoto K. Treatment of dentine hypersensitivity by lasers: a review. *J Clin Periodontol* 2000;27:715-21.
39. Chen WH. Laser root canal therapy. *J Indiana Dent Assoc* 2002;81:20-3.
40. Kreisler M, Kohnen W, Beck M, Al Haj H, Christoffers AB, Gotz H, Duschner H, Jansen B, D'Hoedt B. Efficacy of NaOCl/H₂O₂ irrigation and GaAlAs laser in decontamination of root canals in vitro. *Lasers Surg Med* 2003;32:189-96.
41. Kimura Y, Wilder-Smith P, Matsumoto K. Lasers in endodontics: a review. *Int Endod J* 2000;33:173-85.
42. Stabholz A, Sahar-Helft S, Moshonov J. Lasers in endodontics. *Dent Clin North Am* 2004;48:809-32, vi.

43. García Ortiz De Zárate F, España Tost AJ, Berini Aytés L, Gay Escoda C. Aplicaciones del láser de CO₂ en Odontología. RCOE 2004;9:567-76.
44. Brugnera A, Zanin F, Barbin EL, Spano JC, Santana R, Pecora JD. Effects of Er:YAG and Nd:YAG laser irradiation on radicular dentine permeability using different irrigating solutions. Lasers Surg Med 2003;33:256-9.
45. Pearson GJ, Schuckert KH. The role of lasers in dentistry: present and future. Dent Update 2003;30:70-4, 6.
46. Usumez A, Aykent F. Bond strengths of porcelain laminate veneers to tooth surfaces prepared with acid and Er,Cr:YSGG laser etching. J Prosthet Dent 2003;90:24-30.
47. Christensen GJ. Bleaching teeth: practitioner trends. J Am Dent Assoc 1997;128 Suppl:16S-8S.
48. Jones AH, Diaz-Arnold AM, Vargas MA, Cobb DS. Colorimetric assessment of laser and home bleaching techniques. J Esthet Dent 1999;11:87-94.
49. Jacobson B, Berger J, Kravitz R, Patel P. Laser pediatric crowns performed without anesthesia: a contemporary technique. J Clin Pediatr Dent 2003;28:11-2.
50. Wang X, Ishizaki NT, Suzuki N, Kimura Y, Matsumoto K. Morphological changes of bovine mandibular bone irradiated by Er,Cr:YSGG laser: an in vitro study. J Clin Laser Med Surg 2002;20:245-50.
51. Iaria G, Frati A. Il laser in odontoiatria e in chirurgia orale. Milano: Utet Periodici; 2001.

52. Kimura Y, Yu DG, Fujita A, Yamashita A, Murakami Y, Matsumoto K. Effects of erbium,chromium:YSGG laser irradiation on canine mandibular bone. *J Periodontol* 2001;72:1178-82.
53. Lee CY. Procurement of autogenous bone from ramus with simultaneous the mandibular third-molar removal for bone grafting using the Cr:YSGG laser: a preliminary report. *J Oral Implantol* 2005;31:32-8.
54. Staninec M, Gardner AK, Le CQ, Sarma AV, Fried D. Adhesion of composite to enamel and dentin surfaces irradiated by IR laser pulses of 0.5-35 mus duration. *J Biomed Mater Res B Appl Biomater* 2006.
55. Gouw-Soares S, Tanji E, Haypek P, Cardoso W, Eduardo CP. The use of Er:YAG, Nd:YAG and Ga-Al-As lasers in periapical surgery: a 3-year clinical study. *J Clin Laser Med Surg* 2001;19:193-8.
56. Sumitomo M, Furuya H. Biomedical engineering for the conservation of teeth--the use of a Nd-YAG laser for a treatment of apical focus. *Front Med Biol Eng* 1989;1:89-97.
57. Oltra Arimón D, España Tost AJ, Berini Aytés L, Gay Escoda C. Aplicaciones del láser de baja potencia en Odontología. *RCOE* 2004;9:517-24.
58. Arisu HD, Bala O, Alimzhanova G, Turkoz E. Assessment of morphological changes and permeability of apical dentin surfaces induced by Nd:Yag laser irradiation through retrograde cavity surfaces. *J Contemp Dent Pract* 2004;5:102-13.
59. Gay Escoda C, Berini Aytés L. *Tratado de Cirugía Bucal*. Madrid: Ergon; 2004.

60. Revilla Gutiérrez V, España Tost AJ, Berini Aytés L, Gay Escoda C. Aplicaciones de los láseres de Er:YAG y de Er,Cr:YSGG en Odontología. RCOE 2004;9:551-62.
61. Akyol A, Anadolu R, Anadolu Y, Ekmekci P, Gurgey E, Akay N. Multifocal papillomavirus epithelial hyperplasia: successful treatment with CO₂ laser therapy combined with interferon alpha-2b. Int J Dermatol 2003;42:733-5.
62. Sporri S, Frenz M, Altermatt HJ, Hannigan EV, Dreher E. Treatment of human papillomavirus-associated vulvar disease with the CO₂-laser. Physical and histological aspects with use of a new scanning device, the SwiftLase. Arch Gynecol Obstet 1996;259:25-35.
63. Bradley PF. A review of the use of the neodymium YAG laser in oral and maxillofacial surgery. Br J Oral Maxillofac Surg 1997;35:26-35.
64. España Tost AJ, Velasco Vivancos V, Berini Aytés L, Gay Escoda C. Tratamiento de los angiomas bucales con láser CO₂. Rev Actual Odontoestomatol Esp 1994;43:34-8.
65. Ishikawa I, Aoki A, Takasaki AA. Potential applications of Erbium:YAG laser in periodontics. J Periodontal Res 2004;39:275-85.
66. Miyazaki A, Yamaguchi T, Nishikata J, Okuda K, Suda S, Orima K, Kobayashi T, Yamazaki K, Yoshikawa E, Yoshie H. Effects of Nd:YAG and CO₂ laser treatment and ultrasonic scaling on periodontal pockets of chronic periodontitis patients. J Periodontol 2003;74:175-80.

67. Arnabat-Dominguez J, Espana-Tost AJ, Berini-Aytes L, Gay-Escoda C. Erbium:YAG laser application in the second phase of implant surgery: a pilot study in 20 patients. *Int J Oral Maxillofac Implants* 2003;18:104-12.
68. Pinheiro AL, Cavalcanti ET, Pinheiro TI, Alves MJ, Miranda ER, De Quevedo AS, Manzi CT, Vieira AL, Rolim AB. Low-level laser therapy is an important tool to treat disorders of the maxillofacial region. *J Clin Laser Med Surg* 1998;16:223-6.
69. Kaminer R, Liebow C, Margarone JE, Zambon JJ. Bacteremia following laser and conventional surgery in hamsters. *J Oral Maxillofac Surg* 1990;48:45-8.
70. Roodenburg JL, Panders AK, Vermey A. Carbon dioxide laser surgery of oral leukoplakia. *Oral Surg Oral Med Oral Pathol* 1991;71:670-4.
71. Cozean C, Arcoria CJ, Pelagalli J, Powell GL. Dentistry for the 21st century? Erbium:YAG laser for teeth. *J Am Dent Assoc* 1997;128:1080-7.
72. Burkes EJ, Hoke J, Gomes E, Wolbarsht M. Wet versus dry enamel ablation by Er:YAG laser. *J Prosthet Dent* 1992;67:847-51.
73. Hossain M, Nakamura Y, Yamada Y, Kimura Y, Nakamura G, Matsumoto K. Ablation depths and morphological changes in human enamel and dentin after Er:YAG laser irradiation with or without water mist. *J Clin Laser Med Surg* 1999;17:105-9.
74. Hoke JA, Burkes EJ, Gomes ED, Wolbarsht ML. Erbium:YAG (2.94 μm) laser effects on dental tissues. *J Laser Appl* 1990;2:61-5.

75. Visuri SR, Walsh JT, Wigdor HA. Erbium laser ablation of dental hard tissue: effect of water cooling. *Lasers Surg Med* 1996;18:294-300.
76. Hossain M, Nakamura Y, Yamada Y, Kimura Y, Matsumoto N, Matsumoto K. Effects of Er,Cr:YSGG laser irradiation in human enamel and dentin: ablation and morphological studies. *J Clin Laser Med Surg* 1999;17:155-9.
77. Matsumoto K, Hossain M, Hossain MM, Kawano H, Kimura Y. Clinical assessment of Er,Cr:YSGG laser application for cavity preparation. *J Clin Laser Med Surg* 2002;20:17-21.
78. RizoIU I, Kohanghadosh F, Kimmel AI, Eversole LR. Pulpal thermal responses to an erbium,chromium: YSGG pulsed laser hydrokinetic system. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;86:220-3.
79. Groth EB, Mercer CE, Anderson P. Microtomographic analysis of subsurface enamel and dentine following Er:YAG laser and acid etching. *Eur J Prosthodont Restor Dent* 2001;9:73-9.
80. De Munck J, Van Meerbeek B, Yudhira R, Lambrechts P, Vanherle G. Micro-tensile bond strength of two adhesives to Erbium:YAG-lased vs. bur-cut enamel and dentin. *Eur J Oral Sci* 2002;110:322-9.
81. Schwarz F, Sculean A, Berakdar M, Georg T, Reich E, Becker J. Periodontal treatment with an Er:YAG laser or scaling and root planing. A 2-year follow-up split-mouth study. *J Periodontol* 2003;74:590-6.

82. Kreisler M, Kohnen W, Marinello C, Gotz H, Duschner H, Jansen B, d'Hoedt B. Bactericidal effect of the Er:YAG laser on dental implant surfaces: an in vitro study. *J Periodontol* 2002;73:1292-8.
83. Hossain M, Nakamura Y, Yamada Y, Murakami Y, Matsumoto K. Compositional and structural changes of human dentin following caries removal by Er,Cr:YSGG laser irradiation in primary teeth. *J Clin Pediatr Dent* 2002;26:377-82.
84. Rizioiu IM, Eversole LR, Kimmel AI. Effects of an erbium, chromium: yttrium, scandium, gallium, garnet laser on mucocutaneous soft tissues. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1996;82:386-95.
85. Rupprecht S, Tangermann K, Kessler P, Neukam FW, Wiltfang J. Er:YAG laser osteotomy directed by sensor controlled systems. *J Craniomaxillofac Surg* 2003;31:337-42.
86. Niemz MH. *Laser-Tissue Interactions: Fundamentals and applications*. Springer-Verlag. Berlín; 2003.
87. Gómez De Ferraris M, Campos Muñoz A. *Histología y embriología bucodental*. Madrid: Ed. Médica Panamericana; 1999.
88. Cohen S, Burns R. *The pathways of the pulp*. St. Louis: Mosby; 1998.
89. Ingle J, Bakland L. *Endodoncia*. México D.F.: Mc Graw Hill; 1997.
90. Ten Cate A. *Histología oral. Desarrollo, estructura y función*. Buenos Aires: Ed. Panamericana; 1986.

91. Orban B. *Histología y Embriología Bucal*. México D.F.: Ed. La Prensa Médica Mexicana; 1980.
92. Garberoglio R, Brannstrom M. Scanning electron microscopic investigation of human dentinal tubules. *Arch Oral Biol* 1976;21:355-62.
93. Seltzer S, Bender I. *The dental pulp: Biologic considerations in dental procedures*. St. Louis: Ishiyaju EuroAmerica Inc.; 1990.
94. Butler WT. Dentin extracellular matrix and dentinogenesis. *Oper Dent* 1992;Suppl 5:18-23.
95. Tidmarsh BG. Micromorphology of pulp chambers in human molar teeth. *Int Endod J* 1980;13:69-75.
96. Morse DR. Age-related changes of the dental pulp complex and their relationship to systemic aging. *Oral Surg Oral Med Oral Pathol* 1991;72:721-45.
97. Burke FM, Samarawickrama DY. Progressive changes in the pulpo-dentinal complex and their clinical consequences. *Gerodontology* 1995;12:57-66.
98. Humphreys ER, Robins MW, Stones VA. Age-related and ²²⁴Ra-induced abnormalities in the teeth of male mice. *Arch Oral Biol* 1985;30:55-64.
99. De Munck J, Van Landuyt K, Peumans M, Poitevin A, Lambrechts P, Braem M, Van Meerbeek B. A critical review of the durability of adhesion to tooth tissue: methods and results. *J Dent Res* 2005;84:118-32.

100. García Barbero J, Kessler Nieto F. *Patología y terapéutica dental. Parte II: Operatoria dental.* Madrid: Ed. Síntesis; 1997.
101. Asmussen E, Peutzfeldt A. Resin composites: Strength of the bond to dentin versus surface energy parameters. *Dent Mater* 2005;21:1039-43.
102. Erickson RL. Surface interactions of dentin adhesive materials. *Oper Dent* 1992;Suppl 5:81-94.
103. Wu W, Nancollas GH. The relationship between surface free-energy and kinetics in the mineralization and demineralization of dental hard tissue. *Adv Dent Res* 1997;11:566-75.
104. Kugel G, Ferrari M. The science of bonding: from first to sixth generation. *J Am Dent Assoc* 2000;131 Suppl:20S-5S.
105. Harris RK, Phillips RW, Swartz ML. An evaluation of two resin systems for restoration of abraded areas. *J Prosthet Dent* 1974;31:537-46.
106. Munksgaard EC, Irie M, Asmussen E. Dentin-polymer bond promoted by Gluma and various resins. *J Dent Res* 1985;64:1409-11.
107. Causton BE. Improved bonding of composite restorative to dentine. A study in vitro of the use of a commercial halogenated phosphate ester. *Br Dent J* 1984;156:93-5.
108. Joynt RB, Davis EL, Wiczowski G, Yu XY. Dentin bonding agents and the smear layer. *Oper Dent* 1991;16:186-91.

109. Lambrechts P, Braem M, Vanherle G. Buonocore memorial lecture. Evaluation of clinical performance for posterior composite resins and dentin adhesives. *Oper Dent* 1987;12:53-78.
110. Soderholm KJ, Guelmann M, Bimstein E. Shear bond strength of one 4th and two 7th generation bonding agents when used by operators with different bonding experience. *J Adhes Dent* 2005;7:57-64.
111. Nakabayashi N, Kojima K, Masuhara E. The promotion of adhesion by the infiltration of monomers into tooth substrates. *J Biomed Mater Res* 1982;16:265-73.
112. Macari S, Goncalves M, Nonaka T, Santos JM. Scanning electron microscopy evaluation of the interface of three adhesive systems. *Braz Dent J* 2002;13:33-8.
113. Kanca JT. Effect of resin primer solvents and surface wetness on resin composite bond strength to dentin. *Am J Dent* 1992;5:213-5.
114. Fusayama T, Nakamura M, Kurosaki N, Iwaku M. Non-pressure adhesion of a new adhesive restorative resin. *J Dent Res* 1979;58:1364-70.
115. Wang Y, Spencer P. Physiochemical interactions at the interfaces between self-etch adhesive systems and dentine. *J Dent* 2004;32:567-79.
116. Van Meerbeek B, Yoshida Y, Snauwaert J, Hellemans L, Lambrechts P, Vanherle G, Wakasa K, Pashley DH. Hybridization effectiveness of a two-step versus a three-step smear layer removing adhesive system examined correlatively by TEM and AFM. *J Adhes Dent* 1999;1:7-23.

117. Yoshida Y, Nagakane K, Fukuda R, Nakayama Y, Okazaki M, Shintani H, Inoue S, Tagawa Y, Suzuki K, De Munck J, Van Meerbeek B. Comparative study on adhesive performance of functional monomers. *J Dent Res* 2004;83:454-8.
118. Yoshida Y, Van Meerbeek B, Nakayama Y, Snauwaert J, Hellemans L, Lambrechts P, Vanherle G, Wakasa K. Evidence of chemical bonding at biomaterial-hard tissue interfaces. *J Dent Res* 2000;79:709-14.
119. Inoue S, Van Meerbeek B, Abe Y, Yoshida Y, Lambrechts P, Vanherle G, Sano H. Effect of remaining dentin thickness and the use of conditioner on micro-tensile bond strength of a glass-ionomer adhesive. *Dent Mater* 2001;17:445-55.
120. Lin A, McIntyre NS, Davidson RD. Studies on the adhesion of glass-ionomer cements to dentin. *J Dent Res* 1992;71:1836-41.
121. De Munck J, Van Meerbeek B, Yoshida Y, Inoue S, Suzuki K, Lambrechts P. Four-year water degradation of a resin-modified glass-ionomer adhesive bonded to dentin. *Eur J Oral Sci* 2004;112:73-83.
122. Giachetti L, Bertini F, Scaminaci Russo D, Rubino I. The extension of resin tags in etched dentin: a misinterpretation?. *Minerva Stomatol* 2005;54:139-51.
123. Van Hassel HJ. Physiology of the human dental pulp. *Oral Surg Oral Med Oral Pathol* 1971;32:126-34.
124. Eick JD, Wilko RA, Anderson CH, Sorensen SE. Scanning electron microscopy of cut tooth surfaces and identification of debris by use of the electron microprobe. *J Dent Res* 1970;49:1359-68.

125. Berry EA, Von Der Lehr WN, Herrin HK. Dentin surface treatments for the removal of the smear layer: an SEM study. *J Am Dent Assoc* 1987;115:65-7.
126. Pashley DH. Dentin permeability and dentin sensitivity. *Proc Finn Dent Soc* 1992;88 Suppl 1:31-7.
127. Martin FE. Carious pulpitis: microbiological and histopathological considerations. *Aust Endod J* 2003;29:134-7.
128. Prati C, Chersoni S, Pashley DH. Effect of removal of surface collagen fibrils on resin-dentin bonding. *Dent Mater* 1999;15:323-31.
129. Van Meerbeek B, Inokoshi S, Braem M, Lambrechts P, Vanherle G. Morphological aspects of the resin-dentin interdiffusion zone with different dentin adhesive systems. *J Dent Res* 1992;71:1530-40.
130. Gwinnett AJ. Moist versus dry dentin: its effect on shear bond strength. *Am J Dent* 1992;5:127-9.
131. Perdigao J, Swift EJ, Cloe BC. Effects of etchants, surface moisture, and resin composite on dentin bond strengths. *Am J Dent* 1993;6:61-4.
132. Perdigao J, Lambrechts P, Van Meerbeek B, Vanherle G, Lopes AL. Field emission SEM comparison of four postfixation drying techniques for human dentin. *J Biomed Mater Res* 1995;29:1111-20.

133. Van Meerbeek B, Dhem A, Goret-Nicaise M, Braem M, Lambrechts P, VanHerle G. Comparative SEM and TEM examination of the ultrastructure of the resin-dentin interdiffusion zone. *J Dent Res* 1993;72:495-501.
134. Van Meerbeek B, Conn LJ, Duke ES, Eick JD, Robinson SJ, Guerrero D. Correlative transmission electron microscopy examination of nondemineralized and demineralized resin-dentin interfaces formed by two dentin adhesive systems. *J Dent Res* 1996;75:879-88.
135. Gwinnett AJ. Quantitative contribution of resin infiltration/hybridization to dentin bonding. *Am J Dent* 1993;6:7-9.
136. Nakabayashi N, Watanabe A, Gendusa NJ. Dentin adhesion of "modified" 4-META/MMA-TBB resin: function of HEMA. *Dent Mater* 1992;8:259-64.
137. Fortin D, Vargas MA. The spectrum of composites: new techniques and materials. *J Am Dent Assoc* 2000;131 Suppl:26S-30S.
138. Christensen GJ. Sorting out the confusing array of resin-based composites in dentistry. *J Am Dent Assoc* 1999;130:275-7.
139. Wilder AD, May KN, Swift EJ, Sullivan DJ. Effects of viscosity and surface moisture on bond strengths of resin-modified glass ionomers. *Am J Dent* 1996;9:215-8.
140. Keller U, Hibst R. Effects of Er:YAG laser in caries treatment: a clinical pilot study. *Lasers Surg Med* 1997;20:32-8.

141. Boj J, Galofre N, Espana A, Espasa E. Pain perception in pediatric patients undergoing laser treatments. *J Oral Laser Appl* 2005;5:85-9.
142. Inoue H, Izumi T, Ishikawa H, Watanabe K. Short-term histomorphological effects of Er:YAG laser irradiation to rat coronal dentin-pulp complex. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:246-50.
143. Eversole LR, Rizoiu I, Kimmel AI. Pulpal response to cavity preparation by an erbium, chromium:YSGG laser-powered hydrokinetic system. *J Am Dent Assoc* 1997;128:1099-106.
144. Yu DG, Kimura Y, Kinoshita J, Matsumoto K. Morphological and atomic analytical studies on enamel and dentin irradiated by an erbium, chromium:YSGG laser. *J Clin Laser Med Surg* 2000;18:139-43.
145. Kimura Y, Yu DG, Kinoshita J, Hossain M, Yokoyama K, Murakami Y, Nomura K, Takamura R, Matsumoto K. Effects of erbium, chromium:YSGG laser irradiation on root surface: morphological and atomic analytical studies. *J Clin Laser Med Surg* 2001;19:69-72.
146. Hossain M, Nakamura Y, Tamaki Y, Yamada Y, Murakami Y, Matsumoto K. Atomic analysis and knoop hardness measurement of the cavity floor prepared by Er,Cr:YSGG laser irradiation in vitro. *J Oral Rehabil* 2003;30:515-21.
147. Niu W, Eto JN, Kimura Y, Takeda FH, Matsumoto K. A study on microleakage after resin filling of Class V cavities prepared by Er:YAG laser. *J Clin Laser Med Surg* 1998;16:227-31.

148. Hossain M, Kimura Y, Nakamura Y, Yamada Y, Kinoshita JI, Matsumoto K. A study on acquired acid resistance of enamel and dentin irradiated by Er,Cr:YSGG laser. *J Clin Laser Med Surg* 2001;19:159-63.
149. Palma Dibb RG, Milori Corona SA, Borsatto MC, Ferreira KC, Pereira Ramos R, Djalma Pecora J. Assessing microleakage on class V composite resin restorations after Er:YAG laser preparation varying the adhesive systems. *J Clin Laser Med Surg* 2002;20:129-33.
150. Li ZZ, Code JE, Van De Merwe WP. Er:YAG laser ablation of enamel and dentin of human teeth: determination of ablation rates at various fluences and pulse repetition rates. *Lasers Surg Med* 1992;12:625-30.
151. Lin S, Caputo AA, Eversole LR, RizoIU I. Topographical characteristics and shear bond strength of tooth surfaces cut with a laser-powered hydrokinetic system. *J Prosthet Dent* 1999;82:451-5.
152. Schein MT, Bocangel JS, Nogueira GE, Schein PA. SEM evaluation of the interaction pattern between dentin and resin after cavity preparation using ER:YAG laser. *J Dent* 2003;31:127-35.
153. Bertrand MF, Hessleyer D, Muller-Bolla M, Nammour S, Rocca JP. Scanning electron microscopic evaluation of resin-dentin interface after Er:YAG laser preparation. *Lasers Surg Med* 2004;35:51-7.
154. Sassi JF, Chimello DT, Borsatto MC, Corona SA, Pecora JD, Palma-Dibb RG. Comparative study of the dentin/adhesive systems interface after treatment with Er:YAG laser and acid etching using scanning electron microscope. *Lasers Surg Med* 2004;34:385-90.

155. Visuri SR, Gilbert JL, Wright DD, Wigdor HA, Walsh JT. Shear strength of composite bonded to Er:YAG laser-prepared dentin. *J Dent Res* 1996;75:599-605.
156. Gonçalves M, Corona SA, Borsatto MC, Silva PC, Pecora JD. Tensile bond strength of dentin-resinous system interfaces conditioned with Er:YAG laser irradiation. *J Clin Laser Med Surg* 2002;20:89-93.
157. Donadio-Moura J, Gouw-Soares S, De Freitas PM, Navarro RS, Powell LG, Eduardo CP. Tensile bond strength of a flowable composite resin to ER:YAG-laser-treated dentin. *Lasers Surg Med* 2005;36:351-5.
158. Dunn WJ, Davis JT, Bush AC. Shear bond strength and SEM evaluation of composite bonded to Er:YAG laser-prepared dentin and enamel. *Dent Mater* 2005;21:616-24.
159. Ceballos L, Toledano M, Osorio R, Tay FR, Marshall GW. Bonding to Er-YAG-laser-treated dentin. *J Dent Res* 2002;81:119-22.
160. Sheth KK, Staninec M, Sarma AV, Fried D. Selective targeting of protein, water, and mineral in dentin using UV and IR pulse lasers: the effect on the bond strength to composite restorative materials. *Lasers Surg Med* 2004;35:245-53.
161. Kato G, Nakabayashi N. Effect of phosphoric acid concentration on wet-bonding to etched dentin. *Dent Mater* 1996;12:250-5.
162. Walshaw PR, McComb D. SEM evaluation of the resin-dentin interface with proprietary bonding agents in human subjects. *J Dent Res* 1994;73:1079-87.

163. Nakajima M, Sano H, Zheng L, Tagami J, Pashley DH. Effect of moist vs. dry bonding to normal vs. caries-affected dentin with Scotchbond Multi-Purpose Plus. *J Dent Res* 1999;78:1298-303.
164. Prati C, Chersoni S, Mongiorgi R, Pashley DH. Resin-infiltrated dentin layer formation of new bonding systems. *Oper Dent* 1998;23:185-94.
165. Oliveira SS, Pugach MK, Hilton JF, Watanabe LG, Marshall SJ, Marshall GW. The influence of the dentin smear layer on adhesion: a self-etching primer vs. a total-etch system. *Dent Mater* 2003;19:758-67.
166. Schneider BT, Baumann MA, Watanabe LG, Marshall GW. Dentin shear bond strength of compomers and composites. *Dent Mater* 2000;16:15-9.
167. Crim GA, Swartz ML, Phillips RW. Comparison of four thermocycling techniques. *J Prosthet Dent* 1985;53:50-3.
168. Burger KM, Cooley RL, Garcia-Godoy F. Effect of thermocycling times on dentin bond strength. *J Esthet Dent* 1992;4:197-8.
169. Rossomando KJ, Wendt SL. Thermocycling and dwell times in microleakage evaluation for bonded restorations. *Dent Mater* 1995;11:47-51.
170. Versluis A, Douglas WH, Sakaguchi RL. Thermal expansion coefficient of dental composites measured with strain gauges. *Dent Mater* 1996;12:290-4.
171. Leloup G, D'Hoore W, Bouter D, Degrange M, Vreven J. Meta-analytical review of factors involved in dentin adherence. *J Dent Res* 2001;80:1605-14.

172. Li H, Burrow MF, Tyas MJ. The effect of thermocycling regimens on the nanoleakage of dentin bonding systems. *Dent Mater* 2002;18:189-96.
173. Addison O, Fleming GJ, Marquis PM. The effect of thermocycling on the strength of porcelain laminate veneer (PLV) materials. *Dent Mater* 2003;19:291-7.
174. Ernst CP, Canbek K, Euler T, Willershausen B. In vivo validation of the historical in vitro thermocycling temperature range for dental materials testing. *Clin Oral Investig* 2004;8:130-8.
175. Huang MS, Li MT, Huang FM, Ding SJ. The effect of thermocycling and dentine pre-treatment on the durability of the bond between composite resin and dentine. *J Oral Rehabil* 2004;31:492-9.
176. Dos Santos PA, Garcia PP, Palma-Dibb RG. Shear bond strength of adhesive systems to enamel and dentin. Thermocycling influence. *J Mater Sci Mater Med* 2005;16:727-32.
177. Gale MS, Darvell BW. Thermal cycling procedures for laboratory testing of dental restorations. *J Dent* 1999;27:89-99.
178. Tam LE, Pilliar RM. Fracture surface characterization of dentin-bonded interfacial fracture toughness specimens. *J Dent Res* 1994;73:607-19.
179. Iwaku M, Nakamichi I, Nakamura K, Horie K, Suizu S, Fusayama T. Tags penetrating dentin of a new adhesive resin. *Bull Tokyo Med Dent Univ* 1981;28:45-51.

180. Pioch T, Staehle HJ, Schneider H, Duschner H, Dorfer CE. Effect of intrapulpal pressure simulation in vitro on shear bond strengths and hybrid layer formation. *Am J Dent* 2001;14:319-23.
181. Tantbirojn D, Cheng YS, Versluis A, Hodges JS, Douglas WH. Nominal shear or fracture mechanics in the assessment of composite-dentin adhesion? *J Dent Res* 2000;79:41-8.
182. Versluis A, Tantbirojn D, Douglas WH. Why do shear bond tests pull out dentin? *J Dent Res* 1997;76:1298-307.
183. Burnett LH, Conceicao EN, Pelinos JE, Eduardo CDP. Comparative study of influence on tensile bond strength of a composite to dentin using Er:YAG laser, air abrasion, or air turbine for preparation of cavities. *J Clin Laser Med Surg* 2001;19:199-202.
184. Giachetti L, Scaminaci Russo D, Scarpelli F, Vitale M. SEM analysis of dentin treated with the Er:YAG laser: a pilot study of the consequences resulting from laser use on adhesion mechanisms. *J Clin Laser Med Surg* 2004;22:35-41.
185. Manhaes L, Oliveira DC, Marques MM, Matos AB. Influence of Er:YAG laser surface treatment and primer application methods on microtensile bond strength self-etching systems. *Photomed Laser Surg* 2005;23:304-12.
186. Hara AT, Pimenta LA, Rodrigues AL. Influence of cross-head speed on resin-dentin shear bond strength. *Dent Mater* 2001;17:165-9.
187. Sanchez F, Espana Tost AJ, Morenza JL. ArF excimer laser irradiation of human dentin. *Lasers Surg Med* 1997;21:474-9.

188. Ceballos L, Osorio R, Toledano M, Marshall GW. Microleakage of composite restorations after acid or Er-YAG laser cavity treatments. *Dent Mater* 2001;17:340-6.
189. Moritz A, Schoop U, Goharkhay K, Szakacs S, Sperr W, Schweidler E, Wernisch J, Gutknecht N. Procedures for enamel and dentin conditioning: a comparison of conventional and innovative methods. *J Esthet Dent* 1998;10:84-93.
190. Ayad MF, Rosenstiel SF, Farag AM. A pilot study of lactic acid as an enamel and dentin conditioner for dentin-bonding agent development. *J Prosthet Dent* 1996;76:254-9.
191. Lopes GC, Vieira LC, Monteiro S, Caldeira De Andrada MA, Baratieri CM. Dentin bonding: effect of degree of mineralization and acid etching time. *Oper Dent* 2003;28:429-39.
192. Zhang Y, Agee K, Nor J, Carvalho R, Sachar B, Russell C, Pashley D. Effects of acid-etching on the tensile properties of demineralized dentin matrix. *Dent Mater* 1998;14:222-8.
193. Barceleiro MO, De Mello JB, De Mello GS, Dias KR, De Miranda MS, Sampaio Filho HR. Hybrid layer thickness and morphology: the influence of cavity preparation with Er:YAG laser. *Oper Dent* 2005;30:304-10.
194. Nakabayashi N, Hiranuma K. Effect of etchant variation on wet and dry dentin bonding primed with 4-META/acetone. *Dent Mater* 2000;16:274-9.
195. Soeno K, Suzuki S, Taira Y, Atsuta M. Improvement of the bond strength of 4-META/MMA-TBB resin to collagen-depleted dentin. *J Biomed Mater Res B Appl Biomater* 2005;73:104-8.

196. Corona SA, Atoui JA, Chimello DT, Borsatto MC, Pecora JD, Dibb RG. Composite resin's adhesive resistance to dentin: influence of Er:YAG laser focal distance variation. *Photomed Laser Surg* 2005;23:229-32.
197. Lee BS, Lin CP, Hung YL, Lan WH. Structural changes of Er:YAG laser-irradiated human dentin. *Photomed Laser Surg* 2004;22:330-4.
198. Ramos RP, Chimello DT, Chinelatti MA, Nonaka T, Pecora JD, Palma Dibb RG. Effect of Er:YAG laser on bond strength to dentin of a self-etching primer and two single-bottle adhesive systems. *Lasers Surg Med* 2002;31:164-70.
199. De Souza AE, Corona SA, Dibb RG, Borsatto MC, Pecora JD. Influence of Er:YAG laser on tensile bond strength of a self-etching system and a flowable resin in different dentin depths. *J Dent* 2004;32:269-75.
200. Oliveira DC, Manhaes LA, Marques MM, Matos AB. Microtensile bond strength analysis of different adhesive systems and dentin prepared with high-speed and Er:YAG laser: a comparative study. *Photomed Laser Surg* 2005;23:219-24.

