

REFERENCES

1. Ministry of Public health. The 7th National Oral Health Survey in 2012 by the Thai Bureau of Dental Health. 2012.
2. Ritter AV, Swift EJ. Current restorative concepts of pulp protection. *Endodontic Topics*. 2003; 5(1): 41-8.
3. Ghoddusi J, Forghani M, Parisay I. New approaches in vital pulp therapy in permanent teeth. *Iran Endod J*. 2014; 9(1): 15-22.
4. Ohman A. Healing and sensitivity to pain in yooung replanted human teeth. An experimental, clinical and histological study. *Odontol Tidskr*. 1965; 73: 166-227.
5. Weiner R. Liners and bases in general dentistry. *Aust Dent J*. 2011; 56: 11-22.
6. Aguilar P, Linsuwanont P. Vital Pulp Therapy in Vital Permanent Teeth with Cariously Exposed Pulp: A Systematic Review. *J Endod*. 2011; 37(5): 581-7.
7. Liew Z, Nguyen E, Stella R, Thong I, Yip N, Zhang F, et al. Survey on the teaching and use in dental schools of resin-based materials for restoring posterior teeth. *Int Dent J*. 2011; 61(1): 12-8.
8. Bogen G, Chandler NP. Pulp preservation in immature permanent teeth. *Endodontic topics*. 2010; 23: 131-52.
9. Costa CA, Ribeiro AP, Giro EM, Randall RC, Hebling J. Pulp response after application of two resin modified glass ionomer cements (RMGICs) in deep cavities of prepared human teeth. *Dent Mater*. 2011; 27(7): e158-70
10. Aranha AM, Giro EM, Souza PP, Hebling J, de Souza Costa CA. Effect of curing regime on the cytotoxicity of resin-modified glass-ionomer lining cements applied to an odontoblast-cell line. *Dent Mater*. 2006; 22(9): 864-9.

11. Laurent P, Camps J, About I. Bioceramic TM induces TGF- β 1 release from human pulp cells and early dental pulp mineralization. *Int Endod J.* 2012; 45(5): 439-48.
12. American Academy of Pediatric Dentistry (AAPD). Guideline on Pulp therapy for Primary and Immature permanent teeth. 2014.
13. Jacobsen P. Restorative dentistry An integrated approach 1998.
14. Bjørndal L, Mjör IA. Pulp-dentin biology in restorative dentistry. Part 4: Dental caries--characteristics of lesions and pulpal reactions. *Quintessence Int.* 2001; 32(9): 717-36.
15. Kidd EA, Joyston-Bechal S, Beighton D. Microbiological validation of assessments of caries activity during cavity preparation. *Caries Res.* 1993; 27(5): 402-8.
16. Bjørndal L, Reit C, Bruun G, Markvart M, Kjaeldgaard M, Nasman P, et al. Treatment of deep caries lesions in adults: randomized clinical trials comparing stepwise vs. direct complete excavation, and direct pulp capping vs. partial pulpotomy. *Eur J Oral Sci.* 2010; 118(3): 290-7.
17. Bjørndal L, Thylstrup A. A practice-based study on stepwise excavation of deep carious lesions in permanent teeth: a 1-year follow-up study. *Community Dent Oral Epidemiol.* 1998; 26(2): 122-8.
18. Bjørndal L, Kidd EA. The treatment of deep dentine caries lesions. *Dent Update.* 2005; 32(7): 402-4, 7-10, 13.
19. Bjørndal L, Mjör IA. Pulp-dentin biology in restorative dentistry. Part 4: Dental caries - Characteristics of lesions and pulpal reactions. *Quintessence International.* 2001; 32(9): 717-36.
20. Brannstrom M, Lind PO. Pulpal response to early dental caries. *J Dent Res.* 1965; 44(5): 1045-50.
21. Massler M. Pulpal reactions to dental caries. *Int Dent J.* 1967; 17(2): 441-60.

22. Pinkham JR, et al. Pediatric dentistry. edition F, editor2005.
23. Smith AJ. Pulpal responses to caries and dental repair. *Caries Res.* 2002; 36(4): 223-32.
24. Goldberg M, Farges JC, Lacerda-Pinheiro S, Six N, Jegat N, Decup F, et al. Inflammatory and immunological aspects of dental pulp repair. *Pharmacol Res.* 2008; 58(2): 137-47.
25. Chogle SMA, Goodis HE, Kinaia BM. Pulpal and Periradicular Response to Caries. Current Management and Regenerative Options. *Dental Clinics of North America.* 2012; 56(3): 521-36.
26. Linde A, Goldberg M. Dentinogenesis. *Crit Rev Oral Biol Med.* 1993; 4(5): 679-728.
27. Smith AJ, Cassidy N, Perry H, Begue-Kirn C, Ruch JV, Lesot H. Reactionary dentinogenesis. *Int J Dev Biol.* 1995; 39(1): 273-80.
28. Ricketts D. Management of the deep carious lesion and the vital pulp dentine complex. *Br Dent J.* 2001; 191(11): 606-10.
29. Mjor IA, Sveen OB, Heyeraas KJ. Pulp-dentin biology in restorative dentistry. Part 1: normal structure and physiology. *Quintessence Int.* 2001; 32(6): 427-46.
30. Murray PE, Hafez AA, Windsor LJ, Smith AJ, Cox CF. Comparison of pulp responses following restoration of exposed and non-exposed cavities. *J Dent.* 2002; 30(5-6): 213-22.
31. Hoshino E, Ando N, Sato M, Kota K. Bacterial invasion of non-exposed dental pulp. *Int Endod J.* 1992; 25(1): 2-5.
32. Love RM, Jenkinson HF. Invasion of dentinal tubules by oral bacteria. *Crit Rev Oral Biol Med.* 2002; 13(2): 171-83.
33. Murray PE, About I, Franquin JC, Remusat M, Smith AJ. Restorative pulpal and repair responses. *J Am Dent Assoc.* 2001; 132(4): 482-91.

34. Murray PE, About I, Lumley PJ, Franquin JC, Remusat M, Smith AJ. Cavity remaining dentin thickness and pulpal activity. *Am J Dent.* 2002; 15(1): 41-6.
35. Stanley HR. Dental iatrogenesis. *Int Dent J.* 1994; 44(1): 3-18.
36. Pameijer CH, Stanley HR, Ecker G. Biocompatibility of a glass ionomer luting agent. 2. Crown cementation. *Am J Dent.* 1991; 4(3): 134-41.
37. Murray PE, Windsor LJ, Smith AJ, Mjör IA. Remaining dentine thickness and human pulp responses. *Int Endod J.* 2003; 36(1): 33-43.
38. Ricketts D. Management of the deep carious lesion and the vital pulp dentine complex. *Br Dent J.* 2001; 191(11): 606-10.
39. Murray PE, About I, Lumley PJ, Smith G, Franquin JC, Smith AJ. Postoperative pulpal and repair responses. *J Am Dent Assoc.* 2000; 131(3): 321-9.
40. Micknautsch S, Yengopal V, Banerjee A. Pulp response to resin-modified glass ionomer and calcium hydroxide cements in deep cavities: A quantitative systematic review. *Dent Mater.* 2010; 26(8): 761-70.
41. About I, Murray PE, Franquin JC, Remusat M, Smith AJ. The effect of cavity restoration variables on odontoblast cell numbers and dental repair. *J Dent.* 2001; 29(2): 109-17.
42. Mjor IA, Odont D. Pulp-dentin biology in restorative dentistry. Part 2: initial reactions to preparation of teeth for restorative procedures. *Quintessence Int.* 2001; 32(7): 537-51.
43. Yoshida H, Tsuji M, Matsumoto H. An electrical method for examining remaining dentine thickness. *J Dent.* 1989; 17(6): 284-6.
44. Tielemans S, Bergmans L, Duyck J, Naert I. Evaluation of a preparation depth controlling device: a pilot study. *Quintessence Int.* 2007; 38(2): 135-42.
45. Unemori M, Matsuya Y, Akashi A, Goto Y, Akamine A. Composite resin restoration and postoperative sensitivity: Clinical follow-up in an undergraduate program. *J Dent.* 2001; 29(1): 7-13.

46. Wegeaupt F, Betke H, Solloch N, Musch U, Wiegand A, Attin T. Influence of cavity lining and remaining dentin thickness on the occurrence of postoperative hypersensitivity of composite restorations. *J Adhes Dent.* 2009; 11(2): 137-41.
47. Goldberg M. *the dental pulp biology pathology and regenerative therapies.* Verlag Berlin Heidelberg Germany Springer; 2014.
48. Pashley DH. Dynamics of the pulpo-dentin complex. *Crit Rev Oral Biol Med.* 1996; 7(2): 104-33.
49. Kandaswamy D, Venkateshbabu N. Root canal irrigants. *J Conserv Dent.* 2010; 13(4): 256-64.
50. Carrilho MR, Geraldeli S, Tay F, de Goes MF, Carvalho RM, Tjaderhane L, et al. In vivo preservation of the hybrid layer by chlorhexidine. *J Dent Res.* 2007; 86(6): 529-33.
51. Ersin NK, Candan U, Aykut A, Eronat C, Belli S. No adverse effect to bonding following caries disinfection with chlorhexidine. *J Dent Child (Chic).* 2009; 76(1): 20-7.
52. Komori PC, Pashley DH, Tjaderhane L, Breschi L, Mazzoni A, de Goes MF, et al. Effect of 2% chlorhexidine digluconate on the bond strength to normal versus caries-affected dentin. *Oper Dent.* 2009; 34(2): 157-65.
53. Guneser MB, Akbulut MB, Eldeniz AU. Effect of various endodontic irrigants on the push-out bond strength of biobondine and conventional root perforation repair materials. *J Endod.* 2013; 39(3): 380-4.
54. Jeanssonne MJ, White RR. A comparison of 2.0% chlorhexidine gluconate and 5.25% sodium hypochlorite as antimicrobial endodontic irrigants. *J Endod.* 2006; 20(6): 276-8.
55. Root canal irrigants and disinfectants 2011 Available from:
<http://www.aae.org/colleagues>.

56. Santos JN, Carrilho MR, De Goes MF, Zaia AA, Gomes BP, Souza-Filho FJ, et al. Effect of chemical irrigants on the bond strength of a self-etching adhesive to pulp chamber dentin. *J Endod.* 2006; 32(11): 1088-90.
57. American Academy of Pediatric Dentistry (AAPD). Guideline on pulp therapy for primary and immature permanent teeth. 2010-2011. p. 222-9.
58. Anusavice KJ, Shen C, Rawls HR. Phillip's Science of Dental Materials. 11, editor. Philadelphia: WB Saunders; 2003.
59. Ferracane JL. Materials in dentistry: principles and applications. 2nd, editor. Philadelphia: Lippincott Williams and Wilkins; 2001.
60. Craig RG PJ. Restorative dental materials. 11th, editor. St.Louis, Mo: Mosby; 2002.
61. Draheim RN. Cavity bases, liners and varnishes: a clinical perspective. *Am J Dent.* 1988; 1(2): 63-6.
62. Modena KCS, Casas-Apayco LC, Atta MT, Navarro MFL, Costa CAS, Hebling J, et al. Cytotoxicity and biocompatibility of direct and indirect pulp capping materials. *J Applied Oral Science.* 2009; 17(6): 544-54.
63. Hilton TJ. Cavity sealers, liners, and bases: current philosophies and indications for use. *Oper Dent.* 1996; 21(4):134-46.
64. Stanley HR, Pameijer CH. Dentistry's friend: calcium hydroxide. *Oper Dent.* 1997;22(1):1-3.
65. Weiner RS, Weiner LK, Kugel G. Teaching the use of bases and liners: a survey of North American dental schools. *J Am Dent Assoc.* 1996;127(11):1640-5.
66. Farhad A, Mohammadi Z. Calcium hydroxide: a review. *Int Dent J.* 2005; 55(5): 293-301.
67. Cox CF, Hafez AA, Akimoto N, Otsuki M, Mills JC. Biological basis for clinical success: pulp protection and the tooth-restoration interface. *Pract Periodontics Aesthet Dent.* 1999; 11(7): 819-26; quiz 27.

68. Costa CA, Giro EM, do Nascimento AB, Teixeira HM, Hebling J. Short-term evaluation of the pulpo-dentin complex response to a resin-modified glass-ionomer cement and a bonding agent applied in deep cavities. *Dent Mater.* 2003; 19(8): 739-46.
69. Murray PE, Hafez AA, Smith AJ, Cox CF. Bacterial microleakage and pulp inflammation associated with various restorative materials. *Dent Mater.* 2002; 18(6): 470-8.
70. Weiner R. Teaching the use of liners, bases, and cements: a 10-year follow-up survey of North American Dental Schools. *Dent Today.* 2006; 25(6): 74, 6, 8-9; quiz 9.
71. Hebling J, Giro EM, Costa CA. Human pulp response after an adhesive system application in deep cavities. *J Dent.* 1999; 27(8): 557-64.
72. Leye Benoist F, Gaye Ndiaye F, Kane AW, Benoist HM, Farge P. Evaluation of mineral trioxide aggregate (MTA) versus calcium hydroxide cement (Dycal((R))) in the formation of a dentine bridge: a randomised controlled trial. *Int Dent J.* 2012; 62(1): 33-9.
73. Mickenautsch S, Yengopal V, Banerjee A. Pulp response to resin-modified glass ionomer and calcium hydroxide cements in deep cavities: A quantitative systematic review. *Dent Mater.* 2010; 26(8): 761-70.
74. Marchi JJ, de Araujo FB, Froner AM, Straffon LH, Nor JE. Indirect pulp capping in the primary dentition: a 4 year follow-up study. *J Clin Pediatr Dent.* 2006; 31(2): 68-71.
75. Welbury RR, Murray JJ. A clinical trial of the glass-ionomer cement-composite resin "sandwich" technique in Class II cavities in permanent premolar and molar teeth. *Quintessence Int.* 1990; 21(6): 507-12.
76. Memarpour M, Mesbahi M, Shafiei F. Three-and-a-half-year clinical evaluation of posterior composite resin in children. *J Dent Child (Chic).* 2010; 77(2): 92-8.

77. Camilleri J, Pitt Ford TR. Mineral trioxide aggregate: a review of the constituents and biological properties of the material. *Int Endod J.* 2006; 39(10): 747-54.
78. Parirokh M, Torabinejad M. Mineral trioxide aggregate: a comprehensive literature review--Part III: Clinical applications, drawbacks, and mechanism of action. *J Endod.* 2010; 36(3): 400-13.
79. Petrou MA, Alhamoui FA, Welk A, Altarabulsi MB, Alkilzy M, C HS. A randomized clinical trial on the use of medical Portland cement, MTA and calcium hydroxide in indirect pulp treatment. *Clin Oral Investig.* 2014; 18(5): 1383-9.
80. Watson TF, Atmeh AR, Sajini S, Cook RJ, Festy F. Present and future of glass-ionomers and calcium-silicate cements as bioactive materials in dentistry: biophotonics-based interfacial analyses in health and disease. *Dent Mater.* 2014; 30(1): 50-61.
81. Rajasekharan S, Martens LC, Cauwels RG, Verbeeck RM. Biodentine material characteristics and clinical applications: a review of the literature. *Eur Arch Paediatr Dent.* 2014; 15(3): 147-58.
82. Malkondu O, Karapinar Kazandag M, Kazazoglu E. A review on biodentine, a contemporary dentine replacement and repair material. *Biomed Res Int.* 2014; 2014: 160951.
83. Laurent P, Camps J, De Meo M, Dejou J, About I. Induction of specific cell responses to a Ca₃SiO₅-based posterior restorative material. *Dent Mater.* 2008; 24(11): 1486-94.
84. Tziafa C, Koliniotou-Koumpia E, Papadimitriou S, Tziafas D. Dentinogenic Activity of Biodentine in Deep Cavities of Miniature Swine Teeth. *J Endod.* 2015; 41(7): 1161-6.
85. Koubi S, Elmerini H, Koubi G, Tassery H, Camps J. Quantitative evaluation by glucose diffusion of microleakage in aged calcium silicate-based open-sandwich restorations. *Int J Dent.* 2012; 2012: 105863.

86. Raskin A, Eschrich G, Dejou J, About I. In vitro microleakage of Biodentine as a dentin substitute compared to Fuji II LC in cervical lining restorations. *J Adhes Dent.* 2012; 14(6): 535-42.
87. Camilleri J. Investigation of Biodentine as dentine replacement material. *J Dent.* 2013; 41(7): 600-10.
88. Kayahan MB, Nekoofar MH, McCann A, Sunay H, Kaptan RF, Meraji N, et al. Effect of acid etching procedures on the compressive strength of 4 calcium silicate-based endodontic cements. *J Endod.* 2013; 39(12): 1646-8.
89. Grech L, Mallia B, Camilleri J. Investigation of the physical properties of tricalcium silicate cement-based root-end filling materials. *Dent Mater.* 2013; 29(2): e20-8.
90. Hashem DF, Foxton R, Manoharan A, Watson TF, Banerjee A. The physical characteristics of resin composite-calcium silicate interface as part of a layered/laminate adhesive restoration. *Dent Mater.* 2014; 30(3): 343-9.
91. Odabas ME, Bani M, Tirali RE. Shear bond strengths of different adhesive systems to biodentine. *Sci World J.* 2013; 2013: 626103.
92. Valles M, Mercade M, Duran-Sindreu F, Bourdelande JL, Roig M. Influence of light and oxygen on the color stability of five calcium silicate-based materials. *J Endod.* 2013; 39(4): 525-8.
93. Keskin C, Demiryurek EO, Ozyurek T. Color stabilities of calcium silicate-based materials in contact with different irrigation solutions. *J Endod.* 2015; 41(3): 409-11.
94. Shokouhinejad N, Nekoofar MH, Pirmoazen S, Shamshiri AR, Dummer PM. Evaluation and Comparison of Occurrence of Tooth Discoloration after the Application of Various Calcium Silicate-based Cements: An Ex Vivo Study. *J Endod.* 2016; 42(1): 140-4.
95. Strassler HE, Levin R. Biodentine, Active Biosilicate Technology for Direct and Indirect Pulp Capping. *Oral Health.* 2012; 102(12): 52.

96. Atmeh AR, Chong EZ, Richard G, Festy F, Watson TF. Dentin-cement interfacial interaction: calcium silicates and polyalkenoates. *J Dent Res.* 2012; 91(5): 454-9.
97. Stanley HR, Pameijer CH. Pulp capping with a new visible-light-curing calcium hydroxide composition (Prisma VLC Dycal). *Oper Dent.* 1985; 10(4): 156-63.
98. Vitrebond Technical Product Profile-3M.
99. Biodentine scientific file. Active Biosilicate TechnologyTM, Septodont. Saint-Maur-des-Fossés Cedex, France; 2010
100. Koubi G, Colon P, Franquin JC, Hartmann A, Richard G, Faure MO, et al. Clinical evaluation of the performance and safety of a new dentine substitute, Biodentine, in the restoration of posterior teeth - a prospective study. *Clin Oral Investig.* 2013; 17(1): 243-9.
101. Pocock SJ. *Clinical Trials: A Practical Approach.* Wiley; 1983.
102. Demirjian A, Goldstein H, Tanner JM. A new system of dental age assessment. *Hum Biol.* 1973; 45(2): 211-27.
103. Hashem D, Mannocci F, Patel S, Manoharan A, Brown JE, Watson TF, et al. Clinical and radiographic assessment of the efficacy of calcium silicate indirect pulp capping: a randomized controlled clinical trial. *J Dent Res.* 2015; 94(4): 562-8.
104. Unemori M, Matsuya Y, Hyakutake H, Matsuya S, Goto Y, Akamine A. Long-term follow-up of composite resin restorations with self-etching adhesives. *J Dent.* 2007; 35(6): 535-40.
105. Fuss Z, Trowbridge H, Bender IB, Rickoff B, Sorin S. Assessment of reliability of electrical and thermal pulp testing agents. *J Endod.* 1986; 12(7): 301-5.
106. Caliskan MK. Success of pulpotomy in the management of hyperplastic pulpitis. *Int Endod J.* 1993; 26(2): 142-8.
107. Jespersen JJ, Hellstein J, Williamson A, Johnson WT, Qian F. Evaluation of dental pulp sensibility tests in a clinical setting. *J Endod.* 2014; 40(3): 351-4.

108. Patel S, Wilson R, Dawood A, Foschi F, Mannocci F. The detection of periapical pathosis using digital periapical radiography and cone beam computed tomography - part 2: a 1-year post-treatment follow-up. *Int Endod J.* 2012; 45(8): 711-23.
109. Auschill TM, Koch CA, Wolkewitz M, Hellwig E, Arweiler NB. Occurrence and causing stimuli of postoperative sensitivity in composite restorations. *Oper Dent.* 2009; 34(1): 3-10.
110. Bachoo IK, Seymour D, Brunton P. A biocompatible and bioactive replacement for dentine: is this a reality? The properties and uses of a novel calcium-based cement. *Br Dent J.* 2013; 214(2): E5.
111. Gandolfi MG, Van Landuyt K, Taddei P, Modena E, Van Meerbeek B, Prati C. Environmental scanning electron microscopy connected with energy dispersive x-ray analysis and Raman techniques to study ProRoot mineral trioxide aggregate and calcium silicate cements in wet conditions and in real time. *J Endod.* 2010; 36(5): 851-7.
112. Murray PE, Windsor LJ, Smyth TW, Hafez AA, Cox CF. Analysis of pulpal reactions to restorative procedures, materials, pulp capping, and future therapies. *Crit Rev Oral Biol Med.* 2002; 13(6): 509-20.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved