

Tooth Bleaching in Children and Teens

THEODORE P. CROLL, DDS*, KEVIN J. DONLY, DDS, MS**

Many parents are surprised when their children's primary incisors are lost and replaced with larger, darker, and yellower permanent incisors. The primary (deciduous) teeth are usually so white that they are known universally as "milk teeth." When parents are told the facts about the normal color differences between the respective dentitions, and how apparent that is in the "esthetic zone," they usually are quite disappointed. However both parents and their children are pleased to learn about dental bleaching and how successful it can be for children and teens.

Since 1989, when Haywood and Heymann first described "nightguard vital bleaching," (1) dentistry has been able to offer a number of ways to lighten and brighten permanent teeth. That discovery has given inspiration to a veritable hydrogen peroxide/carbamide peroxide tooth bleaching boom, both in dental industry and in the consumer realm. In addition, much professional research has been inspired resulting in textbooks on the subject, (2–4) and innumerable articles in commercial and scientific dentistry publications.

Inspired by Haywood and Heymann's work, Croll, in the early 1990s, used custom tray dental bleaching for young patients. After much success, a protocol was published on the subject. (5) Some youngsters had tooth bleaching alone and others had bleaching combined with enamel microabrasion for certain teeth that had superficial coloration defects. (6–10)

Consumer companies soon jumped on the tooth bleaching bandwagon and products such as the Crest

Whitestrips[®] (Procter and Gamble) line were introduced. When used correctly, some "over-the-counter" products proved just as successful for young patients as custom-tray-bleaching. (11–16)

Many questions arise about tooth color correction for children and teens. How does bleaching work? Can the method damage enamel or the pulp of teeth? Why are some teeth sensitive during the bleaching application time, what causes the sensitivity, and how can it be controlled? Are products you can buy at the pharmacy, other stores, or on the internet, as effective as custom tray bleaching provided by a dentist? What about "in office" bleaching for young patients? Can primary teeth be bleached? How long does tooth color improvement last? What is the difference between tooth bleaching and enamel microabrasion?

We each have about a quarter century of experience in both private practice and performing clinical research with dental bleaching and enamel microabrasion, in children and teenaged patients. In all that time, certain observations and facts have been established about tooth color correction for young patients. These can be outlined as follows:

- The American Academy of Pediatric Dentistry has a policy about dental bleaching for children and adolescents. (17)
- Tooth bleaching is successful for children and teens, when accomplished correctly, even in the 6 years to 10 years age group, both with the custom tray method or with commercial bleaching "strips." Responsible parental (or guardian) supervision is

*Private practice, pediatric dentistry, Doylestown, Pennsylvania; Affiliate Professor, Department of Pediatric Dentistry, University of Washington School of Dentistry, Seattle, Washington; Adjunct Professor, Pediatric Dentistry, Dental School, University of Texas Health Science Center at San Antonio, San Antonio, Texas

**Professor and Chair, Department of Developmental Dentistry, Dental School, University of Texas Health Science Center at San Antonio, San Antonio, Texas

necessary. Today's recommendations for dental bleaching for young patients are remarkably similar to those made in 1994. (5)

- “The mechanisms of bleaching involve the degradation of the extracellular matrix and oxidation of chromophores located within enamel and dentin.”(18) Tooth bleaching is safe and causes no irreversible tooth structure damage when used correctly. However, gross over-treatment has the potential to harm tooth structure. (18) This can be a concern, especially in overzealous teenagers. (19)
- Tooth sensitivity is common. The prevailing opinion about the cause of tooth sensitivity associated with vital tooth bleaching is that the hydrogen peroxide permeates the enamel and dentin and having access to the pulp spaces, causes a mild, transient inflammatory response. (20–22) In addition, the senior author (TPC) has hypothesized that sensitivity occurs due to fluid dynamics. (23) As oxygen molecules diffuse through the interstitial spaces in the enamel, and accumulate at the dentino-enamel junction, they occupy space, such that pressure might be applied to nerve endings associated with dentinal tubules. This view is consistent with our clinical observations and those scientifically recorded (22) that higher concentrations of bleaching solution cause more sensitivity. Perhaps both pulpal peroxide perfusion and pressure from oxygen “overload” both contribute to tooth sensitivity. We recommend research to further elucidate the cause, or causes, of tooth sensitivity. Some methods of controlling sensitivity are recommended, for example, use of potassium nitrate. (24) Traditional analgesics (eg. ibuprofen, acetaminophen) can also be used in the first few days of bleaching, for patients with much sensitivity.
- We believe that a tooth bleaching protocol in children should be consistent with clinical research findings of safety and efficacy. After successfully using both hydrogen peroxide and carbamide peroxide products of varying concentrations, up to 20%, we suggest bleaching for young patients using 10% (or less) carbamide peroxide or hydrogen peroxide solution which represents an ideal combination of safety, comfort for the patient, and efficiency. 30 to 45 minute bleach sessions are ideal.

The bleach solution undergoes salivary dilution and is much less effective when the tray or strip remains for extended periods. We recommend one or two sessions per day, depending on patient preference.

- We have no experience with “in office” dental bleaching and are not aware of any pediatric dentistry specialists or general dentists who provide this method of tooth whitening treatment for children or teenagers. In addition, we were not able to find any published reports on the subject.
- Internal dental bleaching for discolored endodontically treated teeth in young patients can be performed in the same way as for adults. Special care must be taken to isolate and insulate the endodontic filling material from the bleach, so as to avoid resorption of the cervical region of the root. An internal dentin replacement filling that chemically combines to tooth structure is necessary for this procedure. A dual-hardened resin-modified glass-ionomer cement is our preference, with an overlying bonded resin-based composite enamel replacement, after the bleaching is completed. (25) Sodium perborate has been used traditionally for internal tooth bleaching. Alternatively, a cotton pellet moistened with carbamide bleaching solution, sealed into place with a temporary resin-modified glass-ionomer filling material, serves well as the bleaching vehicle in such cases.
- We have no experience bleaching teeth in the primary dentition. However, some have advocated dental bleaching for injured primary anterior teeth that become discolored. (26) We urge caution in this approach, to assure the vitality of such teeth, so that underlying permanent teeth are not in jeopardy of developmental disturbance from intramedullary inflammatory changes. (27)
- Dental bleaching can be successful for patients having dark tooth discoloration associated with dentinogenesis imperfecta, (28) or tetracycline dentinal staining. (29) (30) However, treatment can take many months of daily application for desired tooth color improvement in such cases, and complete reversion to a normal tooth color is not expected.

- Patients having brown or white enamel dysmineralization related to fluorosis or of idiopathic origin can undergo enamel microabrasion before or after dental bleaching, for the best color correction result. (6–10) The microabrasion eliminates superficial intrinsic enamel stain and the bleach lightens the deeper internal stain. Our preference is to complete the microabrasion first, but both methods work well.
- It is our experience, and research shows (31), that results of tooth bleaching last many years. However, there is some “rebound” effect as time goes by. Renewed application of the bleach by custom trays or commercial strips easily renews the original effect.

In summary, dental bleaching for children and teenagers is safe, beneficial, and can be performed in a similar manner as for adults. Young patients need to be supervised by an adult during bleaching procedures. We also suggest that that guidance by a dentist is recommended so that etiology of any tooth discoloration can be ascertained, and proper treatment planning achieved, before treatment is considered.

REFERENCES

1. Haywood VB, Heymann HO. Nightguard vital bleaching. *Quintessence International* 1989;20:173–6.
2. Goldstein RE, Garber DA. Complete Dental Bleaching. Chicago/Berlin, Quintessence Publishing Company, Inc., 1995.
3. Greenvall L. Bleaching Techniques in Restorative Dentistry. London, Martin Dunitz Ltd., 2001.
4. Haywood VB. Tooth Whitening: Indications and outcomes of nightguard vital bleaching. Quintessence Publishing Co., Inc. Chicago/Berlin, 2007.
5. Croll TP. Tooth bleaching for children and teens: A protocol. *Quintessence International* 1994;25: 811–17.
6. Cvitko E, Swift EJ, Denehy GE. Improved esthetics with a combined bleaching technique: A case report. *Quintessence Int* 1992;23:91–3.
7. Killian CM. Conservative color improvement for teeth with fluorosis-type stain. *J American Dental Assoc* 1993;124:72–4.
8. Croll TP, Segura A. Tooth color improvement for children and teens: Enamel microabrasion and dental bleaching. *J Dentistry for Children* 1996;63:17–22.
9. Croll TP. Aesthetic correction for teeth with fluorosis and fluorosis-like enamel dysmineralization. *J Esthetic Dentistry* 1998;10:21–9.
10. Donly KJ, Lin B. Tooth bleaching alone and in conjunction with microabrasion in children. *J Pedi Dent Care* 2003;9(3):32–3.
11. Donly KJ, Gerlach RW. Clinical Trials on the Use of Whitening Strips in Children and Adolescents. *Gen Dent* 2002;50(3):242–5.
12. Donly KJ, Donly AS, Baharloo L, Rojas-Candelas E, Garcia-Godoy F, Zhou X, Gerlach RW. Tooth Whitening In Children. *Compend Contin Educ Dent* 2002;23(1A):22–8.
13. Donly KJ. The Adolescent Patient: Special Whitening Challenges. *Compend Contin Educ Dent* 2003 Apr;24(4A):390–6.
14. Donly KJ. Tooth Whitening in Children and Adolescents. *J Esthet Restor Dent* 2005;17(6):380–3.
15. Donly KJ, Kennedy PA, Segura A, Gerlach RW. Effectiveness and Safety of Tooth Bleaching in Teenagers. *Pediatr Dent* 2005;27(4):298–302.
16. Donly KJ, Segura A, Henson T, Barker ML, Gerlach RW. Randomized controlled trial of professional at-home tooth whitening in teenagers. *Gen Dent* 2007 Nov;55(7):669–74.
17. American Academy of Pediatric Dentistry Council on Clinical Affairs. Policy on dental bleaching for child and adolescent patients. *Pediatr Dent* 2008–2009;30(7 Suppl):61–3.
18. Goldberg M, Grootveld M, Lynch E. Undesirable and adverse effects of tooth-whitening products: a review. *Clin Oral Investig* 2010;14(1):1–10.
19. Lee SS, Zhang W, Lee DH, Li Y. Tooth whitening in children and adolescents: a literature review. *Pediatr Dent*. 2005;27(5):362–8.
20. Bowles WH, Ugwuneri Z. Pulp chamber penetration by hydrogen peroxide following vital bleaching procedures. *J Endo* 1987;13(8):375–7.
21. Cooper JS, Bokmeyer TJ, Bowles WH. Penetration of the pulp chamber penetration by carbamide peroxide bleaching agents. *J Endo* 1992;18:315–17.
22. Moncada G, Sepulveda D, Elphick K, Contente M, Estay J, Bahamondes V, Fernandez E, Oliveira OB, Martin J. Effects of light activation, agent concentration, and tooth thickness on dental sensitivity after bleaching. *Operative Dentistry* 2013;38(5):4670476.
23. Croll TP. Bleaching sensitivity. (Letter). *J American Dental Association* 2003;134(9):1168.
24. Haywood VB. Treating sensitivity during tooth whitening. *Compend Contin Educ Dent* 2005;26(9 Suppl 3):11–20.

PERSPECTIVES

25. Croll TP. Adhesive restoration of an endodontically treated incisor. *Quintessence International* 1993;24(5):319–22.
26. Brantley DH, Barnes KP, Haywood VB. Bleaching primary teeth with 10% carbamide peroxide. *Pediatr Dent* 2001;23(6):514–16.
27. Croll TP, Pascon EA, Langeland K. Traumatically injured primary incisors: A clinical and histological study. *J Dentistry for Children* 1987;54:401–22.
28. Croll TP, Sasa IS. Carbamide peroxide bleaching of teeth with dentinogenesis imperfecta discoloration: Report of a case. *Quintessence International* 1995;26:683–6.
29. Kugel G, Gerlach RW, Aboushala A, Ferreira S, Magnuson B. Long-term use of 6.5% hydrogen peroxide bleaching strips on tetracycline stain: a clinical study. *Compend Contin Educ Dent* 2011;32(8):50–6.
30. Leonard RH Jr, Van Haywood B, Caplan DJ, Tart ND. Nightguard vital bleaching of tetracycline-stained teeth: 90 months post treatment. *J Esthetic Restor Dent* 2003;15(3):142–53.
31. Ritter AV, Leonard RH Jr, St Georges AJ, Caplan DJ, Haywood VB. Safety and stability of nightguard vital bleaching: 9 to 12 years post-treatment. *J Esthet Restor Dent* 2002;14(5):275–85.