

Two Decades of Tooth Whitening

What Has Changed?

Course Description:

The demand for esthetic dentistry has increased in recent years. Whitening products have evolved to meet the needs of today's dental patients. This course will outline the evolution of these products using current scientific literature and evidenced-based strategies. To provide clinicians practical guidelines, different types of products and materials will be reviewed to aid the dental professional in choosing the most appropriate product and technique. By comparing tooth whitening advancements that have taken place over the last two decades, clinicians can help their patients achieve the best clinical results.

Lecture Objectives:

Upon completion of the course, participants will be able to:

- Implement ADPIE in relationship to tooth whitening
- Describe the mechanism of action of tooth whitening
- Review different types of discolorations
- Discuss potential side effects and precautions with tooth whitening
- Discuss treatment options for tooth sensitivity due to tooth whitening
- Discuss alternative uses for whitening products

1. Definitions

- **Bleaching:** involves free radicals and the breakdown of pigment, which occurs in the tooth bleaching procedures
- **Whitening:** refers to the use of abrasive agents contained in a dentifrice to remove extrinsic stains
- **Niteguard Vital Bleaching(NGVB):** the use of a custom tray that allows for administration and containment of tooth bleaching material such as Carbamide peroxide or hydrogen peroxide
- **Extrinsic:** occur on the external surface of the tooth and may be removed by procedures of toothbrushing, scaling, and/or polishing
- **Intrinsic:** occur within the tooth substance and cannot be removed by techniques of scaling and polishing
- **Oxidation:** chemical process utilizing peroxide, as the oxidizing agent penetrates the porosities in the rod-like crystal structure of enamel and breaks down stain deposits in the dentin

2. History

- Barbers were the first to actually whiten teeth
 - Red/White barber pole
 - Barbers doubled as surgeons
 - Filed down teeth with metal file
 - Applied highly corrosive nitric acid
- 2000 BC - 2000 BC Egyptians pumice & vinegar
 - Ancient Romans used urine and goat milk
 - Utilized well into 18th century
- 18th Century - First esthetic dentistry Dr. Truman
 - 1854 used chlorinated lime and chlorine gas
- Today

- Carbamide Peroxide
- Hydrogen Peroxide
- Laser
- Enhancement of appearance
 - Considered more attractive
 - Look younger
 - Portrays GOOD health
- Medical/Dental history for whitening
- Communication
 - Identify underlying problems causing discoloration
 - May prevent color change
 - Precipitate need for additional treatment
 - Color appearance may worsen if source of problem isn't resolved
 - Administration
 - Delivery
 - Implementation and monitoring

3. Research

- ADA Recommendations
 - Always consult with dentist
 - Complete evaluation of oral environment
 - Dentist and patient collaborate on treatment
 - Whitening and restorative treatment combination

4. Mechanism of Action

- Concentration of active ingredient-% of active ingredient
- Exposure time-minutes to hours
- Formulation-Hydrogen Peroxide vs Carbamide Peroxide
- Oxidation
- Whitening factors
 - Free radicals attack large color molecules
 - Carbamide Peroxide => H₂O₂ & urea
 - Hydrogen Peroxide => H₂O & O

5. Diagnosis and Assessment

- ADPIE
- Patient needs to know limitations and results of whitening vs. other esthetic treatment
 - Amalgam restorations
 - Defects in gingival architecture
 - Effects of fluorosis
 - Esthetic restorations
 - Facial imperfection
 - Gummy smile
 - Misaligned teeth
 - Root surface
 - Tetracycline stain
 - Translucent teeth
 - Tobacco stain
 - White spots

6. Planning and Preparation

- Use only as directed
- Don't overload tray
- Fully seat tray
- Store properly
- Contact office

7. Products and Modes of Delivery

- Professional application
 - Take home
 - Carbamide Peroxide solutions 10%, 15%, 20%
 - Hydrogen Peroxide solutions 24%, 36%, 40%
 - In-office
 - Power whitening
 - Laser
- Non-professional application
 - Mall kiosks, spas, cruise ships
 - Supreme Court ruling 2015

- Pens, mouth rinses, toothpastes, strips, pens
- Light activation
 - Acidic agents cause demineralization
 - Controversial/varied outcomes
 - Different thickness of enamel
 - Saliva - buffers, remineralization and re-hydrates
 - Several mechanisms
 - Streaking or blotching
 - Tooth dehydration
 - Transient

8. Maintenance and Sensitivity

- Mechanism of sensitivity
- Enamel & dentin permeable to hydrogen peroxide
 - Causes reversible pulpitis
- Hypertonic nature of gel may activate hydrodynamic mechanism
- Mechanical pressure from tray
- Onset of sensitivity
- Occurs within first 2 weeks
- Dependent upon
 - Concentration of whitening agent
 - Frequency of application
 - Inherent patient sensitivity
- Preventive strategies
 - Brush with 5% Potassium Nitrate desensitizing paste 2 weeks prior
 - Wear empty tray for 1-2 nights
 - Wear tray with Potassium Nitrate 1-2 nights before whitening
 - Continue brushing with Potassium Nitrate
 - 30 mins. prior to tray insertion
 - 30 mins. after whitening
- Therapeutic strategies
 - Passive
 - Decrease concentration of whitening agent
 - Reduce wear time or frequency of application
 - Temporarily interrupt treatment
 - Active
 - Continual brushing with desensitizing paste
 - Wear tray with desensitizing paste 10-30 mins.

- Wear tray with desensitizing paste overnight 1-2 nights
- Professional strength fluoride products
 - Occludes tubules-forms calcium fluoride precipitate
 - 5000 ppm (1.1%) NaF
 - 5% NaF varnish
 - 0.4% Stannous fluoride
- Calcium phosphate technologies
 - Occludes tubules-forms calcium phosphate precipitate or HCA-like layer
 - ACP
 - ACP-CPP-Recaldent®
 - MI Paste™ & MI Paste Plus™ products
 - Not a cleansing paste
 - Requires multiple applications/day
 - Releases ACP during acid challenge
- Calcium sodium phosphosilicate-NovaMin®
 - NUPRO® extra care prophy paste
 - Releases calcium & phosphate forming an enamel-like mineral layer
- Arginine bicarbonate & calcium carbonate PRO-ARGIN™ Technology
 - Colgate® Sensitive Pre-Procedural Desensitizing Paste with Pro-Argin™ Technology
 - In-office application only
 - No phosphate
 - Occludes tubules via calcium deposits
 - Not a polishing paste

9. Influencing Factors on Treatment
--

- Speed of color change can only be pushed so far
- Teeth do not whiten at the same rate
- Some will whiten faster
 - Some tooth color change noticeable within days
 - Others may take extended period of time (2-6 weeks)
 - Increasing length of treatment or percentage of solution may not impact rate
- Reversal post treatment occurs and stain reappears
 - Hydrogen Peroxide changes color of stain doesn't remove stain molecules
 - Time that elapses post treatment varies
- Etching caused by acidic formulations result in whiter appearance
 - Tooth rehydrates and remineralizes, whiter effect disappears

10. What's On The Horizon

- Research today is looking beyond the cosmetic outcomes of whitening
 - Benefit of tray whitening to prevent caries in elderly
 - Prevention of white-spot lesions in orthodontic population
- Additional studies/benefits
 - Improvement in soft tissue health and elimination of oral malodor
 - 10% Carbamide Peroxide kills one of two bacteria causing caries (lactobacillus)

11. Summary

- Tooth whitening is safe and effective
- Vital to perform a pre-whitening examination & diagnosis
- Common problems associated with whitening
 - Resolved when clinicians are aware
- Tooth whitening is in high demand by patients
 - Can be successfully implemented in dental practices today

REFERENCES

- 1) Basson, R., Grobler, S., & Osman, Y. (2013). Guidelines for the selection of tooth whitening products amongst those available on the market. *sadj*, 68(3), 122-129.
- 2) Burwell AK, Litowski LJ and Greenspan DC. *Adv Dent Res* 2009;21:35-39
- 3) ADA council on scientific affairs: Laser-assisted bleaching and update. *J Am Dent Assoc* 129(10):1484-1487, 1998. Kugel, et. al 2006.
- 4) Bernie RDH BS RYT, K. M. (2013, May 1). Professional Whitening: The Role of the Dental Hygienist. *IneedCE.com*. Retrieved January 25, 2014, from <http://www.rdhmag.com/content/dam/rdh/print-articles/Volume%2033/Issue%205/1305RDH065-072.pdf>
- 5) Cannabrava VP, Fernandes SL, Calabria MP, Magalhães AC, Ishikiriama SK, Atta MT, Wang L. Bleaching technique effect on dentin permeability. *Am J Dent*. 2014 Jun;27(3):145-8.
- 6) Christensen GJ. At-Home Tooth Bleaching, State-Of-Art 2001. *Clinical Research Associates (CRA) Newsletter*. 2001 Feb;25(2):2-4
- 7) Dunn, J. (1998) *Compendium* Aug Vol 19, No 8
- 8) Dyett, L. (n.d.). Teeth Whitening: How it Works and What it Costs. *Teeth Whitening*. Retrieved July 8, 2014, from <http://www.yourdentistryguide.com/teeth-whitening/>
- 9) Giniger M, Spaid M, MacDonald J, Felix H. A 180-day clinical investigation of the tooth whitening efficacy of a bleaching gel with added amorphous calcium phosphate. *J Clin Dent*. 2005;16(1):11-6.
- 10) Haywood DMD, V. (2009). In-Office Bleaching: Lights, Applications, and Outcomes. *Current Practice*, 16, 3-6.
- 11) Haywood DMD, V. & DDS, MSD, PhD, Y. L. (2009, September 1). Tooth Whitening/Bleaching: for Dentists and Their Patients. *ADA Council of Scientific Affairs*. Retrieved July 8, 2014, from http://www.ada.org/~media/ADA/About%20the%20ADA/Files/whitening_bleaching_treatment_considerations_for_patients_and_dentists.ashx
- 12) Haywood DMD, V. B. (2012). Pre-Bleaching Exam Vital for Optimum Whitening. *Compendium*, 33(1), 76-77.
- 13) Haywood, D. A. (2010). Use of tray-applied 10 percent carbamide peroxide gels for improving oral health in patients with special-care needs. *JADA*, 639-646
- 14) Haywood, V. B. (2007). Bleaching and caries control in elderly patients. *Aesthetic dentistry today*, 42-44.
- 15) Javaheri, D., & Janis, J. (2000). The Efficacy of Reservoirs in Bleaching Trays. *Operative Dentistry*, 25(3), 149-51.
- 16) Jones, L. DDS, BS, RDH, & Moon, C. BA, CDA, (2011, October 1). A Clinical Report on Chairside Whitening. *IneedCE.com*. Retrieved January 25, 2014, from http://www.ineedce.com/courses/2213/PDF/1111cei_whitening_web.pdf
- 17) Kwon, S., Ko, S., Greenwall, L., & Goldstein, R. E. (2009). *Tooth whitening in esthetic dentistry*. London: Quintessence.
- 18) Marson, F., Sensi, L., Vieira, L., & Araujo, E. (2008). Clinical Evaluation of In-Office Dental Bleaching With and Without the Use of Light-activation Sources. *Operative Dentistry*, 33(1), 15-22.
- 19) Matis, B., Wang, G., & Eckert, G. (2009). A Clinical Evaluation of Two In-office Bleaching Regimens With and Without Tray Bleaching. *Operative Dentistry*, 34(2), 142-149.

- 20) Matis, B., Cochran, M., & Eckert, G. (2009). Review of the Effectiveness of Various Tooth Whitening Systems. *Operative Dentistry*, 34(2), 230-235.
- 21) Matis BA, Cochran MA, Eckert GJ, Matis JI. In vivo study of two carbamide peroxide gels with different desensitizing agents. *Oper Dent*. 2007 Nov- Dec;32(6):549-55
- 22) Milleman JL, Milleman KR, Clark CE, Mongiello KA, Simonton TC, Proskin HM. NUPRO sensodyne prophylaxis paste with NovaMin for the treatment of dentin hypersensitivity: a 4-week clinical study. *Am J Dent* 2012 Oct;25(5):262-8.
- 23) Morales, R. R., Marimon, J. L., Schneider, L. F., Sobrinho, L. C., Camacho, G. B., & Bueno, M. (2006). Carbamide peroxide bleaching agents: effects on surface roughness of enamel, composite and porcelain. *Clinical Oral Investigations*, 10(1), 23-28.
- 24) Nagelberg, DDS, R. (2013, March 1). Professional Whitening Services: Prioritizing and Implementing for Success. *IneedCE.com*. Retrieved January 25, 2014, from http://www.ineedce.com/courses/2395/pdf/1301cei_pro_whitening.pdf
- 25) Neuhaus KW, Milleman JL, Milleman KR, Mongiello KA, Simonton TC, Clark CE, Proskin HM, Seeman R. Effectiveness of a calcium phosphosilicate-containing prophylaxis paste in reducing dentine hypersensitivity immediately and 4 weeks after a single application: a double-blind randomized controlled trial.
- 26) [Price RB¹](#), [Sedarous M](#), [Hiltz GS](#). The pH of tooth-whitening products. *J Can Dent Assoc*. 2000 Sep;66(8):421-6.
- 27) Pruthi, G., Kandpal, H., Mathur, V. P., & Shah, N. (2010). Effect of Bleaching on Color Change and Surface Topography of Composite Restorations. *International Journal of Dentistry*, 2010, 1-7.
- 28) Sensitive Teeth Causes and Treatment. (2003). *Journal of American Dental Association*, 134(787), 1691-1691.
- 29) [Sulieyman M¹](#), [MacDonald E](#), [Rees JS](#), [Newcombe RG](#), [Addy M](#). *J Esthet Restor Dent*. 2006;18(2):93-100; discussion 101. Tooth bleaching by different concentrations of carbamide peroxide and hydrogen peroxide whitening strips: an in vitro study.
- 30) Swift, Edward J. DMD, MS. *J Am Dent Assoc* 2009; 140 (May): 526-535
- 31) ["The History of Teeth Whitening – Smiles Through the Miles"](#). 09-11-2008. Retrieved 2014-09-3
- 32) Uthappa R1, Suprith ML, Bhandary S, Dash S. A comparative study of different bleaching agents on the morphology of human enamel: an in vitro SEM study. *J Contemp Dent Pract*. 2012 Nov 1;13(6):756-9.
- 33) Vastardis, P. D. (2006) *Dentistry Today*, 25 (3)
- 34) <http://www.drbcuspil.com/index.aspx?sec=sup&sub=cos&pag=dis&ItemID=313229>
- 35) Uthappa R1, Suprith ML, Bhandary S, Dash S. A comparative study of different bleaching agents on the morphology of human enamel: an in vitro SEM study. *J Contemp Dent Pract*. 2012 Nov 1;13(6):756-9.
- 36) Wilkins, E. (2013). Tooth Bleaching. In *Clinical Practice of the Dental Hygienist* (Eleventh ed., pp. 709-721). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.



DENTSPLY INTERNATIONAL is an ADA/CERP recognized provider. ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.