Part 1 Introduction and In-Office Bleaching

Introduction

- Restorative Dentistry is changing. “The more we cut tooth, the more we weaken tooth.”
- We have been trained mostly in “mechanical dentistry” however now we must also become trained in “chemical dentistry”.
- Bleaching works, but how do we optimize its effectiveness?
- European Commission’s Scientific Committee on Consumer Products (SCCP)
  1. Use of products up to 0.1 HP is safe.
  2. Use of products from 0.1-6% is safe with approval of dentist.
  3. There is an absence of studies on adverse effects in mouth.
  4. Over-the-counter products should not be available.
- “It seems that everybody in America wants whiter teeth to make them feel younger and provide beautiful smiles and accompanying increase in self-esteem.”
  Christensen JADA 133:1277;2002
- To promote bleaching have posters, offer staff bleach and discuss color at restorative appointment.
  Ask patients, “How do you like your smile?”

Goal is to remove stain
- Extrinsic—Stain, which is deposited on the outside surface.
- Whitener will lighten calculus and the subsurface structure.
- Intrinsic—Stain, which is incorporated into the tooth structure before or after eruption.
- Tooth whiteners penetrate tooth surface to affect the color.

In-Office Bleaching

- Respondents’ satisfaction with In-office bleaching:
  Very satisfied-16%, Satisfied 32%, Unsatisfied 23%, Very unsatisfied 5%
  CRA Newsletter 29:2;2005
- Advantages: Rapid tooth whitening, -no gel ingested.
- Disadvantages: Greater sensitivity, rapid reversal of tooth whitening, possible “burning” of tissues.
- Overview of In-office bleaching products. Basic details from manufacturers on 14 systems.
  Freedman, Dental Products Report 36:82;2002
- In vivo study of eight In-office bleaching systems: A pilot study (alphabetical order). Manufacturer’s were invited to come observe use of their product.
  Accelerated In-Office by Life Like ArcBrite by Biotrol
  Illumine by Dentsply BriteSmile by BriteSmile
  Niveous by Shofu PolaOffice by Southern Dental Industries
  One Hour Smile by Den-Mat Corp Zoom! by Discus Dental
  Initial bleaching was good, but large reversal occurred within one week with most of the products.
  Franco and Al-Ammar, Masters Theses, Indiana University 2003

- Effectiveness of In-office products evaluated with and without use of light.
  Opalescence Xtra Boost PolaOffice Rembrandt Lighten Plus
  LumaArch Niveous LaserSmile
  Zoom!
  One-year recall shows that light use does not increase whitening over non-light use.
  CRA Newsletter 28:1-2;2004
- The effect of intrapulpal temperature rise on vitality of pulp in Rhesus monkies.
- How effective is piggybacking both In-office and At-home products? Most effective is In-office followed by At-home.
  Matis, unpublished
- In-office agents should be used when patients want rapid tooth whitening or when they cannot wear a
tray. When possible have patient use tray whiteners to “boost” In-office whiteners.

Matis, J Esthet Restor Dent 16:87-88;2004

-Effects of In-office tooth whiteners on hardness and surface finish of tooth colored restoratives. Both are material dependent and minimally affected by bleaching agents.

-ADA accepted In-office product is not as effective as ADA accepted At-home product.

Part 2 At-Home Bleaching- The Science

At-Home Bleaching
-Respondents’ satisfaction with At-home bleaching:
  Very satisfied-49%, Satisfied 45%, Unsatisfied 1%, Very unsatisfied 1%
  CRA Newsletter 29:2;2005

Concentrations to use
-Effectiveness of different concentrations of carbamide peroxide: An in vitro study has shown it just takes longer with lower concentrations.
  Leonard et al., Quint Int 29:503-07;1998

-There appears to be an “inherent lightness potential” of teeth. Six anterior teeth attain the same color.

-American Dental Associations (ADA) first guidelines on safety and efficacy of bleaching agents were issued in 1994.
  J Am Dent Assoc 125:1140-42;1994

-The following products are accepted as safe and effective by the ADA.
  Colgate Platinum Daytime Professional Whitening System 10%
  Nite White Classic Whitening Gel 10%
  Opalescence Whitening Gel 10%

-Tooth Bleaching- A Critical Review of the Biological Aspects recommends 10% CP

-Procedure for making tray:
  Make stone model
  Reduce to approximately one inch high
  Place resin using palm method
  Vacuum form plastic (allow to droop 1 inch, cool model on platform)
  Gross reduction on model
  Finer reduction on model
  Lift tray off model
  Trim to cervical margin (indicated by transparent area)
  Reverse directions on trimming

-Instructions for use:
  Thoroughly brush teeth
  Express agent into reservoirs
  Seat tray and express excess
  Brush off excess
  Rinse twice with water
  Remove residual gel after removing tray in morning

Studies to review effectiveness of whitening agents
-All had at least 24 subjects, bleached for 14 days and used reservoirs in trays.
-All maxillary anterior teeth evaluated for color objectively and subjectively.
-First study showed clinical safety and effectiveness of 10% CP. 20% of patients experience large change, 50% moderate, 20% slight and 10% very little or none. Little change after one month.
  Matis et al., Quint Int 29:555-563;1998

-Compare three other studies
  10% CP and 15% CP, overnight. No difference between 10% and 15% four weeks post-bleaching.
  Matis et al., Quint Int 31:303-310;2000
  15% CP and 5.5% HP, ½ hour 2X daily. No difference in lightness between HP or CP
Panich, Masters Thesis, IUSD, 1999
20% CP and 7.5% HP, 1 hour 2X daily. 20% CP or 7.5% used 1 hr twice daily produces same lightness as 10% CP overnight.
Mokhlis et al., J Am Dent Assoc 131:1269-1277;2000
-CP has same bleaching capacity as HP at comparable concentrations.
-Color reversal plateaus between 1 and 4 weeks post-bleaching.

Histological changes after bleaching
-Minor histological changes that were observed with 10% CP used overnight are considered to be reversible. No moderate or severe histological changes observed.
Gonzalez-Ochoa, J. Masters Thesis IUSD 2002
-Penetration of the pulp chamber by carbamide peroxide bleaching agents occurs very rapidly, within fifteen minutes.
Cooper et al., J Endo18:315-17;1992

Sensitivity
-Tray alone causes tooth sensitivity in 15-20% of patients, add placebo agent and 20-30% report tooth sensitivity, add active agent instead of placebo and 55-75% report tooth sensitivity.
Haywood, J Dent Res 79:519(#3001);2000
-To reduce tooth sensitivity:
  Have patient use agent with potassium nitrate after bleaching for 10-30 minutes.
  Have patient use agent less often.
  Have patient wear the tray for a shorter period of time.
Haywood, Quint Int 32:105-09;2001
-Sodium Lauryl Sulfate, a foaming agent in toothpaste, may cause gingival irritation or apthous ulcers.
-To reduce tissue sensitivity, have patient more effectively remove excess bleaching agent that comes out of the tray and have tray trimmed shy of cervical collar of gingiva.

Effects on teeth
-Caries susceptibility does not increase with bleaching. Use of PF reduces caries susceptibility.
Al-Qunaian, Op Dent 30:265;2005
-10% CP has shown to cause minimal microhardness (Knoop) changes with in situ studies in enamel.
Araujo et al., J Esthet Restor Dent 15:166-173;2003
-No effect on microhardness. Significant reduction of shear bond strength for two weeks after bleaching.
Metz, Masters Thesis, IUSD 2006

Degradation
-Rapid initial degradation of carbamide peroxide agent and then it slows down.
  87% of agent recoverable after 15 seconds in vivo
  66% of agent recoverable after 1 hour in vivo
  53% of agent recoverable after 2 hours in vivo
  31% of agent recoverable after 4 hours in vivo
  18% of agent recoverable after 6 hours in vivo
  6% of agent recoverable after 10 hours in vivo
Matis et al., J Am Dent Assoc 130:227-235;1999
-Causes of loss of recoverable agent are a combination of 1) physical loss of agent, 2) product degradation, 3) anti-oxidant degradation, 4) Increased temperature and 5) absorbent tooth.
-No clinical difference in degradation of various concentrations of CP or with or without reservoirs.
  *Matis et al., Op Dent 27:12-18;2002
-More rapid degradation of hydrogen peroxide
  61% of agent recoverable after 5 minutes in vivo
  56% of agent recoverable after 10 minutes in vivo
  49% of agent recoverable after 20 minutes in vivo
  44% of agent recoverable after 30 minutes in vivo
  38% of agent recoverable after 45 minutes in vivo
  32% of agent recoverable after 60 minutes in vivo
Al-Qunaian et al., Op Dent 28:236-241;2003
-Ingestion of coffee/tea during bleaching is shown with objective evaluation to retard tooth whitening.
Unpublished data from 4 studies.

- How long to use agent. Usually two weeks (but I have bleached yellow teeth for two months).
- Rebleaching should be done when needed, about every 1-3 years
- How fast? One day of rebleaching for every 5-7 days of initial bleaching.
- How long does tooth whitening last?
  Leonard et al., J Esthet Rest Dent 15:142-152;2003
- Is overbleaching to be avoided? Yes, it may cause teeth to turn gray.
  “All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy.” Paracelsus (1493-1541)
- Daily ingestion of CP should not exceed 10mg. Includes safety factor of 100.
- Excellent article entitled “Biological Properties of Peroxide-containing Tooth Whiteners” is available.
  Li, Food and Chemical Toxicity 34;887-904;1996
  Matis, Op Dent 27;103;2002 Book reviewed

Over the counter whitening toothpaste
- Lighten teeth, but very slowly.
- Whitening toothpaste decreased reversal of color that happens after vital tooth bleaching.

Over the counter whitening gels
- They can be divided into Stock Trays, Strips, Paint-on, Wraps and Tray-in-tray products.
- Most research on Over-the-counter products have been accomplished by manufacturers.
- How much peroxide is found in saliva? Depends on how it is used.
  Hanning et al., Am J of Dent 18:13;2004
- When patients ask about over-the-counter bleaching I tell them:
  Gel is usually higher percentage than recommended.
  It is entry level bleaching
  Works, but not as well as tray bleaching
  ADA accepts only 3 products. All have 10% CP.

- Comparison of studies is very difficult. Different criteria, instruments and personnel are used. At IUSD we have completed 12 studies, most of which are published or will soon be published.

Part 3 Clinical Cases: The Test is in the Taste

1) 4 year old who fell down, traumatizing deciduous central incisors, which were bleached for a total of 47 hours.
2) 19-year-old male, endodontically treated #8, placed glass ionomer plug, bleached internally and externally for 2 weeks each. Followed for 2 months post-bleaching.
3) 36-year-old female, trauma caused discoloration of tooth #8, no periapical pathology, bleached 6 weeks. Followed for 4 months post-bleaching.
4) 28-year-old male, semi-professional football player/student, canal in tooth #9 calcified and tooth discolored, bleached for 5 weeks, rebleached after 9 months.
5) 62-year-old female bleached mandibular teeth 6 weeks. Followed for 2 months post-bleaching.
6) Lightened stained craze line on left central incisor on 66-year-old female. Followed for 4 months post-bleaching.
7) Hypocalcified area was bleached for 14 days, white spot lightened rapidly then returned to original color after cessation of bleaching.
8) Unhappy person who was dissatisfied with vital bleaching and decided on veneers.

Stubborn stains
- Fluoride
  Remove fluoride staining, a post eruptive stain in enamel, three ways:
1) Beaching, 2) microabrasion with HCl acid, 3) use bur to remove stain
Croll, J Am Dent Assoc 128:S45-S50;1997

-Tetracycline
Remove tetracycline staining, a pre-eruptive stain in dentin, usually with bleaching
Matis et al. Quint Int 33:645-655;2002

Clinical Cases
1) Right 15%--Left 20%
2) Right 10%--Left 20%
3) Right 20%--Left 15%
4) Right 20%--Left 15%

Thank you for your attention

* Means articles are available on Dr Matis’ web site- www.bamatis.com

Questions patients often ask and their answers

How long do I use the product?
Usually from 2-4 weeks. (On some teeth that are yellow due to aging, I have used the agents for 2 months. Use it as long as teeth continue to lighten. Dr. Haywood has used agents for 12 months on tetracycline stained teeth.)

When will I notice some effect?
In about three days.

What if I cannot wear the tray all night?
Wearing the tray is usually not a problem. The tray is like a contact lens; it stays in place with the gel. Some people will salivate more the first couple of nights. If you find you cannot sleep with it through the night we will have you wear it in the morning or evening for a couple of hours. That way will just take a little longer.

What happens if I miss a day?
No problem, just wear it the following evening.

How long does the lightness from the bleaching last?
It usually lasts from one to three years. In some patients there is no reversal. (They very seldom return to the original discoloration, except for smokers.)

Can I rebleach?
Yes, use the same tray. The product is good for 18 months in the refrigerator.

How fast does rebleaching work?
You will need to rebleach one day for each 5-7 days you originally bleached.

I am pregnant, can I use At-Home whitening agents?
We recommend you not use it until you have completed nursing. (There is no evidence it would harm the newborn, but no studies have conducted to determine if it would harm the offspring. This is an elective procedure so it is better to wait.)

Do I bleach both arches at the same time?
No, first bleach the maxillary arch. (Patients do not sense teeth are lightening if both arches are bleached at the same time.) You will have less chance of TMD discomfort if you bleach one arch at a time.

Is it true that laser bleaching is more effective than at-home bleaching?
No. (The American Dental Association has stated that laser bleaching is not more effective than at-home bleaching.)

How young can you begin bleaching?
Dr. Haywood has bleached patients as young as four when there has been a need for it.

Will it damage my teeth or overall health?
There are three agents, which have been accepted as “safe” and “effective”. If you use any of those products as recommended, they have been shown not to harm the teeth or your overall health.

Will it damage my crowns or fillings?
No, it will not damage fillings or crowns. It will not lighten them either. It will discolor some temporary filling materials.

There is an excellent article on my web site by Dr Haywood entitled “Frequently Asked Questions about Bleaching”, which was published in Compendium 24(4A):324-338;2004.