Bleaching and Esthetic Bonding of Tetracycline-Stained Teeth

ABSTRACT

Nightguard vital bleaching or dentist-prescribed, home-applied bleaching has brightened many patients’ smiles. However, tetracycline stains still present a problem. This article presents a case report citing many of the principles and knowledge about bleaching tetracycline-stained teeth, including at-home versus in-office treatment, sensitivity incidence/treatment, and longevity of treatment. The case report couples bleaching principles with the esthetic principles of smile analysis and bonding for total esthetic improvement. This combination of bleaching and bonding is very conservative, both physically and financially, in the restorative management of a patient with esthetic concerns.

Learning Objectives

After reading this article, the reader should be able to:

• Explain the indications of bleaching tetracycline-stained teeth.
• Explain the limitations of bleaching tetracycline-stained teeth.
• Recognize the esthetic principles necessary to restoratively manage a patient with space problems and discolored composites.
• Counsel patients as to reasonable expectation and treatment success.

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days before the treated side was indistinguishable from the untreated side. The patient was given the maxillary tray (Sof-Tray, Ultradent Products Inc) and an ADA-approved 10% carbamide peroxide (Opalescence, Ultradent Products Inc) to apply nightly. Other products that could have been used are Colgate Platinum (Colgate Oral Pharmaceuticals) and Rembrandt Classic (Oral-B/Rembrandt). A log form was used to gather data as to when color change was noticeable, note the presence of sensitivity, and count the number of syringes used with this tray design and arch size. The old composite was not removed before bleaching because it has been determined that bleaching will progress under existing composite or veneer restorations.10 After 2 months of treatment, the central and lateral incisors were beginning to reach their maximum lightness, but the canines had not completed their lightening (Figure 3). The patient expressed interest in obtaining a higher concentration of carbamide peroxide, again to hopefully shorten the treatment time.11 She was given 16% carbamide peroxide, but after 5 days had to discontinue use because of tooth sensitivity. After several days' rest for the teeth, she resumed the 10% carbamide peroxide application in the custom tray. There were no gingival irritations on the scalloped or non-scalloped portions of the tray with 10% carbamide peroxide. She used roughly 28 syringes in the first 60 days' treatment. Her total treatment time was approximately 5 months, with some times of no treatment because of...
illness, travel, or other personal situations (Figure 4).

When the maxillary arch was completed to the patient's satisfaction as compared with the mandibular teeth, bleaching treatment of the mandibular arch was begun. The patient periodically experienced sensitivity on the mandibular incisors. This sensitivity was treated successfully with potassium nitrate and fluoride in the bleaching tray (Ultra EZ, Ultradent Products Inc). Total treatment time for the mandibular arch was also approximately 5 months. Treatment of one arch at a time gave a good comparison to the patient for bleaching progress, minimized the number of teeth available to be sensitive, and avoided any significant impact on occlusion. Single-arch treatment also reduces the entry fee for the patient to experience bleaching when finances or outcomes are in question.

When the bleaching was completed and the patient was satisfied with the shade of the maxillary anterior teeth, a smile analysis was completed. This analysis evaluated:
1. The relationship of the dental midline and the facial midline (Figure 5).
2. The incisal length of the maxillary incisors relative to the wet/dry line of the lower lip in a full smile (Figure 6).
3. The mesial-distal and incisal-gingival proportion of the lateral incisors and canines if the midline diastema was closed.
4. The presence of consistent and symmetrical gingival tissue contours.

The patient was uncertain whether she wanted the diastema closed. Orthodontic wax was added to the midline diastema
Figure 9—The left central incisor was restored to match the facial midline and finished completely.

Figure 10—A curing shield was placed between the operatory light and the patient to extend working time for sculpting the composite restoration.

Figure 11—The right central incisor was restored against the finished restoration on the left central incisor to close the diastema and fill the proximal space.

Figure 12—Note the buccal-lingual width of the incisal edge was maintained, and the occlusion was distributed equally, while remaining off the composite where possible.

Figure 13—Removing all but 2 mm to 3 mm of the cutting edge of a No. 12 surgical blade allows the operator to grasp the blade without cutting the thumb.

Figure 14—Polished restorations providing diastema closure with facing surfaces being mirror images of each other.

Figure 15—When the midline is correct, marks were made so the widths of the two central incisors are the same, and the line angles are identical in shape.

Figure 16—The distal surface of the right central incisor was restored with retraction cord placed to exposed the mesial gingival decay on the lateral incisors.

(Figure 7) to simulate the closure of the space for the patient. This quick chairside technique helped the patient decide to fill the space between the central incisors. Sculpting and curing composite resin to the unetched enamel could have achieved the same effect. Other options for diagnostic evaluations are using the bleaching casts for a diagnostic wax-up, using Scotch tape on a photograph to color in the teeth, or employing computer simulation.

The smile analysis revealed that the facial midline did not exactly coincide with the dental midline but was reasonably close enough to match. The incisal length of the centrals and the mesial of the lateral incisors did not interfere with phonetics or function. The proper proportion of the central, laterals, and canines could be maintained near the golden proportion of 1:6.1:0.618 if the midline diastema was closed and the mesial of the lateral incisors was augmented. Also the height-to-width ratio of the incisors could be maintained near 10:8. Finally, the gingival height and contours were acceptable except for the right lateral incisor. The patient was informed that this area might require a facial gingivoplasty to be consistent with the left lateral incisor.

Because teeth may bleach to a shade lighter than B1 (Vita Classic Shade Guide, Vita Zahnfabrik; US Distributor, Vident), manufacturers now make composite materials in lighter shades. Teeth also do not all achieve the same shade post-bleaching, so a range of shades lighter than B1 from which to choose is desirable. It is also desirable to have composites that are both opaque and translucent. The correct shade and brand of composite was selected (B1) and confirmed by placing and curing small amounts of different shades and types of composite (Figure 8) directly on the wet teeth. It is important to use either water or bonding resin beneath the resin before curing so the refractive index of the light penetrating the resin to the tooth is not altered. It is also important to cure the composites for the final shade because even light-cured composites change shade on curing. The choice of composite also must include the determination of whether an opaque or translucent material is needed. It is often necessary to place the restoration in layers, using the opaque material beneath the translucent material to prevent the graying effect of the light shining through large restorations. Because of the amount of space to close, an opaque composite shade B1 was chosen (Amelogen, Ultradent Products Inc). Another opaque product that could have been used is Renamel Microfill (Cosmedent, Inc).

The mesial of the left central incisor was restored first, contoured and polished to fill the portion of the midline diastema to correct the midline discrepancy (Figure 9). The appropriate emergence profile was established to allow for oral hygiene efforts and yet to fill the space between the contact point and the gingival papilla. This was compared to the midline of the face (Figure 5) to confirm the position. To allow extended working time while placing and sculpting the composite material, a curing shield was held between the operatory light and the patient (Figure 10). This technique allows unlimited working time with lighter composites, which otherwise would set up from the operatory light or the ambient room light. The mesial of the right central incisor was then restored as a mirror image of the left central incisor (Figure 11). The buccal-lingual dimension of the incisal edge of the existing tooth was maintained to add bulk and strength to the restoration and to produce a translucency similar to that of the natural tooth. The occlusion was evaluated and any anterior guidance was distributed to as many teeth as possible (Figure 12), as well as adjusted to avoid occlusion on the composite bonding where possible. A No. 12 surgical blade was altered and used to trim and contour any excess proximal composite.12

With this technique, the composite resin can be carved in a manner similar to carving amalgam (Figure 13).

Restoration was continued from the midline distally (Figure 14) by next augmenting the distal surfaces of the central incisors (Figure 15) and then the mesial surfaces of the lateral incisors (Figure 16). As these surfaces were restored, it was important to view them from the incisal (Figure 17) to create the proper facial embrasures. These facial embrasures help define the line angles in the composite that simulate the line angles and embrasures on the contralateral teeth (Figure 18). To help visualize these
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Case Study continued

When restoring the mesial of the lateral, the matrix band did not form the composite well, causing a loss of embrasure and increasing the apparent width of the tooth. (Figure 17)

By defining the facial embrasure line angles, the tooth appears the correct size and contour. (Figure 18)

The prominent line angles are marked to create mirror images of adjacent teeth and equal-sized same teeth. Measurements are from the midline out. (Figure 19)

The final restorations are polished. (Figure 20)

Six months after placement of restorations and completion of bleaching. (Figure 21)

Two years after placement of restorations and completion of bleaching. (Figure 22)

The EZ Now Tray was fabricated because the original predetermined closure tray would no longer fit. (Figure 23)

Four-year postoperative views after repair of the distal fracture of composite on left lateral from bruxism habit. (Figure 24)

CONCLUSION

This case report supports previous literature that tetracycline-stained teeth generally take 2 to 6 months for successful bleaching. In this clinical situation, using an in-office 35% hydrogen peroxide to “jump-start” or shorten the treatment time did not alter the outcome, and may incur a nonjustified fee unless the patient has an immediate need for lightening in the next few days. As reported in other articles, higher concentrations of carbamide peroxide may invite increased sensitivity. Sensitivity may be treated using potassium nitrate and fluoride in the bleaching tray in place of the bleaching material. For this patient, bleaching/bonding was a good conservative first step of treatment for diagnosis of the esthetic potential and may become the final treatment. As many articles have demonstrated, bonding should be delayed for 2 weeks postbleaching to allow the tooth shade to stabilize and the bonding to reach its maximum bond strengths. This treatment benefits from the fact that bleaching will occur under existing restorations, so their removal is not required until the bleaching process is completed. Knowledge of esthetic principles of natural teeth is important to harmonize tooth size discrepancies and produce a successful esthetic outcome of any anterior restoration. Bleaching should be attempted on tetracycline-stained teeth because that treatment can be the final solution for the discoloration or can make it easier to achieve an esthetic outcome with subsequent bonding or veneers.

DISCLOSURE

Dr. Haywood is a consultant to Ultradent Products Inc, Colgate Oral Pharmaceuticals, Discus Dental, Inc, Block Drug Company, Marion Laboratories, Procter & Gamble, Dental Learning Systems, American

thermoplastic tray was fabricated chairside without casts (EZ Now Tray, Ultradent Products Inc) to satisfy her concerns. (Figure 23)

The EZ Now Tray uses water heated to boiling in a microwave oven to soften the tray. After the water is heated, the tray is gently “waved” in the water until the anterior flange begins to curl. It is then shaken free of water, and inserted in the mouth without collapsing the tray. When the softened tray is inserted in the mouth and “finger-adapted” to the patient's teeth, the patient becomes the “vacuum-former,” providing suction with his/her lips, while occluding into maximum intercuspation. When the tray has cooled, the flanges are removed with scissors. The tray is then resoftened in the water, which has now cooled somewhat. The patient again applies suction for the final fit. The anterior handle is then removed with scissors. This tray is available only to dentists either in bleaching kits or in bulk. The tray has a thin but tough anterior portion, with a thicker lingual portion to provide rigidity when softened. The time to fabricate an EZ Now Tray is roughly the same time as making an alginate impression.

At the 4-year recall, the patient had chipped one area on the composite bonding, which was in occlusal function (Figure 24). Roughing, re-etching, and bonding the same composite material easily repaired this chip. Her previous temporomandibular dysfunction history warrant- ed that a splint was appropriate, so a bruxism splint was fabricated to protect the bonding as well as allow for episodic treatment during stressful times of her life. The patient has been very pleased with her bleaching and bonding experience and enjoys the new look of her teeth.
Dental Association, ArchTek, Inc, and GlaxoSmithKline. He has received grant support from Colgate Oral Pharmaceuticals, Ultradent Products Inc, Marion Laboratories, Block Drug Company, and ArchTek Inc. He is a sponsored speaker for Colgate Oral Pharmaceuticals, Ultradent Products Inc, Discus Dental, Inc, Dentsply International, and GlaxoSmithKline. He also received product support from many bleaching companies.

REFERENCES

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1. Some tetracycline-stained teeth may take how long or longer of nightly treatment to achieve a satisfactory result?
   a. 2 to 6 weeks
   b. 6 to 8 weeks
   c. 2 to 6 months
   d. 2 to 6 years

2. Which discolorations are most difficult?
   a. Yellow
   b. Brown
   c. Gray
   d. Red

3. Banded discolorations are more difficult than uniform discolorations, especially if the center band is:
   a. yellow.
   b. brown.
   c. gray.
   d. red.

4. Minocycline is the most commonly prescribed and safest drug used in young adults for treatment of:
   a. facial acne.
   b. tinnitus.
   c. asthma.
   d. allergies.

5. For extended bleaching treatment, 7½-year follow-up studies have demonstrated no detrimental effects on the:
   a. tooth.
   b. pulp.
   c. patient.
   d. All of the above.

6. A log form was used to:
   a. gather data as to when color change was noticeable.
   b. note the presence of sensitivity.
   c. count the number of syringes used with this tray design and arch size.
   d. All of the above.

7. Options for diagnostic evaluations are:
   a. using the bleaching casts for a diagnostic wax-up.
   b. using scotch tape on a photograph to color the teeth.
   c. employing computer simulation.
   d. All of the above.

8. What was used in-office to “jump-start” or shorten the treatment time but did not alter the outcome?
   a. 10% hydrogen peroxide
   b. 35% hydrogen peroxide
   c. 10% carbamide peroxide
   d. 35% carbamide peroxide

9. Higher concentrations of carbamide peroxide may invite:
   a. increased sensitivity.
   b. increased erosion.
   c. decreased abrasion.
   d. periodontal-endodontic complications.

10. Bonding should be delayed for how long postbleaching?
    a. 1 hour
    b. 1 day
    c. 1 week
    d. 2 weeks

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