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Abstract

There's a great deal of excitement about what modern dental materials and techniques can do to change the appearance of a person's smile; however, all-at-once smile makeover treatments do not enable clinicians to plan treatments in the most conservative, creative, and minimally invasive manner possible. This article will discuss the 3-phase treatment of a patient who presented with a "trifecta" of desired alterations for her teeth (eg, length/shape, color, and diastema) and how each was successfully addressed directly and nonaggressively. In particular, the sequencing of enameloplasty, take-home vital tooth bleaching, and reversible composite placement for space closure is explained and demonstrated.

Learning Objectives

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

- discuss potential treatment alternatives or sequences of different conservative procedures for altering the appearance of a patient's smile.
- describe the role of take-home tooth whitening in the esthetic transformation of discolored dentition.
- identify possible components of take-home whitening formulas that could contribute to patient compliance and comfort.
- understand the need for proper timing between whitening and subsequent restorative procedures in the smile-design process.

When patients present requesting changes to multiple aspects of their dentition—from color and shape to length and spacing—it can be tempting for clinicians to pursue cosmetic treatments

Sequencing Three Conservative, Minimally Invasive Treatments

that can accomplish the most dramatic alterations all at once. There is a tendency to assume that dramatic smile transformations require dramatic reduction procedures; however, all-at-once treatments (eg, veneers, crowns, or other indirect restorations) leave little room for reversibility. Many techniques exist to correct a patient's particular esthetic concerns, and not all require irreversible reduction of tooth structure.¹

For example, consider the patient who presents with a "trifecta" of desired alterations for his or her teeth (length/shape, color, and diastema). An evaluation of tooth proportionality in the context of the patient's mouth and face may lead to a conclusion that enameloplasty is sufficient to appropriately change the appearance of the smile architecture.^{2,3} Depending on the degree of tooth discoloration, take-home vital tooth bleaching may be sufficient to effect the necessary color change in the teeth that will result in a significantly different smile appearance.⁴ Furthermore, if there are minor but unwanted gaps between teeth, closure using a reversible composite placement technique may be warranted and could produce a dramatic difference in how the tooth arrangement is perceived. Augmentation of the mesiodistal coronal dimension of anterior teeth without

mechanical preparation is among the most gratifying minimally invasive composite placement procedures.⁵

Case Presentation

A 27-year-old woman—the author's dental hygienist—presented with concerns about the length of her maxillary central incisors. Specifically, she indicated that they were too long and hit her lower lip when she smiled (Figure 1). Overall, she felt that her maxillary anterior teeth were "too shovel shaped" and didn't complement the shape of her head (Figure 2). Additional esthetic concerns included a desire for whiter teeth and closure of the diastema between teeth Nos. 8 and 9.

As a dental professional, she was not interested in addressing her concerns via indirect restorations and the reduction procedures they would require. She adamantly requested ultra-conservative treatment to alter the appearance of her smile.

Examination

A comprehensive examination was performed that included radiographs, photographs, and an occlusal analysis. The morphological, occlusal, and optical characteristics of the patient's anterior teeth were observed. Incisal attrition was noted on teeth



Figure 1—Close-up preoperative view of the patient's natural smile.



Figure 2—Close-up retracted preoperative view of the patient's teeth. Note the incisal attrition on teeth Nos. 6, 7, 10, and 11.



Figure 3—The height of the central incisors was determined to be 13 mm.



Figure 4—Enameloplasty on tooth No. 9 resulted in a reduction of 1 mm to 1.5 mm; minimal incisal reduction was achieved on teeth Nos. 10 and 11.



Figure 5—Close-up view of the patient's natural smile after completion of the approved enameloplasty.



Figure 6—Close-up retracted postenameloplasty view of the patient's anterior dentition.

Nos. 6, 7, 10, and 11. As a result, an occlusal guard was recommended and constructed after the completion of the case. Overall, the patient was in good health, and no pathologies were identified that would contraindicate conservative esthetic treatment.

Consultation and Treatment Planning

A 3-fold treatment plan was developed to esthetically alter the patient's smile. Specifically, teeth Nos. 6 through 11 would be reshaped using enameloplasty based on smile design concepts to enhance the outline of her teeth. This would be performed so that the resulting tooth length and shape would appear to match and complement the overall appearance of the patient's face.³ Subsequently, the patient's desire for whiter

teeth would be addressed with the use of a take-home vital tooth bleaching system (Opalescence Trèswhite Supreme, Ultradent Products, Inc) that would enable her to direct her own whitening regimen. This whitening product has the added benefit of providing enamel-rebuilding and sensitivity-preventing fluoride.^{6,9} After sufficient time had elapsed and after the completion of the bleaching regimen, a reversible, conservatively prepared composite placement (Vit-I-escence, Ultradent Products, Inc) procedure would be performed to close the diastema between teeth Nos. 8 and 9, eliminating the unwanted dark triangle.

Enameloplasty

Before determining the patient's desired tooth length and shape, a caliper was used to measure the height of the

central incisors, which was determined to be 13 mm (Figure 3). The Golden Proportion (ie, width-to-height ratio) also was measured. Then, assorted smile design books and visual aids were used to assist the patient in selecting a template for tooth shaping and enameloplasty.

Enameloplasty was first completed on teeth Nos. 9 through 11, with a reduction of 1 mm to 1.5 mm on tooth No. 9, and minimal incisal reduction on teeth Nos. 10 and 11 (Figure 4). The recontouring completed on teeth Nos. 9 through 11 was verified and then subjected to patient approval before completion of the enameloplasty on teeth Nos. 6 through 8. The result was an enhanced overall smile proportion after this phase of the 3-part, minimally invasive treatment plan (Figures 5 and 6).



Figure 7—Subjective shade analysis using the Vita Classic Shade Guide determined the prebleaching shade to be A1.



Figure 8—A digital spectrophotometer (EasyShade, Vident) was used to confirm the prebleaching shade.



Figure 9—The bleaching trays were tried in the patient's mouth before dispensing the bleaching product and dismissing the patient.



Figure 10—The in-office demonstration of the use of the take-home bleaching system included application of the bleaching gel into the trays, after which they were seated in the patient's mouth.



Figure 11—Close-up retracted view of the maxillary central and lateral incisors after the 10-day take-home bleaching procedure.



Figure 12—The postbleaching tooth shade was assessed 7 days after the completion of the whitening regimen and determined to be OM2.

Take-Home Vital Tooth Bleaching

Before demonstrating and dispensing the take-home vital tooth bleaching system, a subjective shade analysis of the patient's teeth was performed using the Vita Classic Shade Guide (Vident). The patient's prebleaching shade was determined to be A1 (Figure 7). The prebleaching tooth shade was confirmed digitally using a digital spectrophotometer (EasyShade, Vident) (Figure 8).

The patient was given a demonstration of the preloaded maxillary and mandibular trays for the take-home vital tooth bleaching system. This whitening system was selected based on the concentration of the whitening agent (ie, 10% hydrogen peroxide for faster whitening results), a more comfortable and conveniently

preloaded tray design to help ensure patient compliance, and a fluoridated formula to reduce sensitivity, rebuild enamel, and prevent caries.⁶⁻⁹

The bleaching trays were tried in the patient's mouth as part of the in-office demonstration before dispensing the bleaching product and dismissing the patient (Figures 9 and 10). The patient used the take-home regimen for 10 days for between 30 minutes and 1 hour each day. It's important to note that regardless of changes in formulations and delivery systems, the literature states that the efficacy of vital tooth bleaching depends on tooth surfaces being in direct contact with the appropriate concentration of active whitening agents for a specific time.⁴

Seven days after the completion

of at-home bleaching, the color change of the patient's teeth was assessed (Figure 11). The postbleaching shade was OM2 (Figure 12).

Reversible Diastema Closure

After waiting an additional 3 days after bleaching (a total of 10 days postbleaching), the patient returned for closure of the diastema between teeth Nos. 8 and 9. The literature has demonstrated that vital tooth bleaching may have a negative effect on the physical properties, marginal integrity, and enamel and dentin bond strength of restorative materials,^{10,11} and that at least 7 days should be allowed between enamel bleaching and the placement of adhesive bonding agents/composite resin restorations.¹²



Figure 13—The selected composite shade (Pearl Frost, Vit-I-escence, Ultradent Products, Inc) was previewed on tooth No. 9. Note that this composite shade represents a high value enamel replacement.



Figure 14—Postoperative close-up view of the patient's natural smile. Note the enhanced balance, proportion, and shade.



Figure 15—Postoperative close-up retracted view of the patient's anterior dentition after enameloplasty, vital tooth bleaching, and diastema closure using direct composite.

The selected composite shade (Pearl Frost, Vit-I-escence) was previewed on tooth No. 9 before initiating the conservative-preparation restorative procedure (Figure 13). This composite shade represented a high-value enamel replacement. The mesial surfaces of teeth Nos. 8 and 9 were minimally altered using a yellow-stripe diamond (Brasseler USA) to roughen the enamel. This ultra-fine preparation extended 1 mm onto the facial surfaces to blend the material into the natural enamel. Maintaining the preparations in enamel is credited with enhancing the bond strengths of composite materials.¹³⁻¹⁵

Because the patient exhibited Class 1 occlusion, no lingual preparation was necessary. The occlusion was examined before the restorative phase to prevent any interferences that might compromise the durability of the diastema closure. Then, the mesial aspects of teeth Nos. 8 and 9 were etched according to the manufacturer's instructions (UltraEtch, Ultradent Products, Inc)^{16,17} after which they were cleaned, rinsed, and dried.

A dentin bonding agent (Peak LC Bond, Ultradent Products, Inc) was applied to the mesial aspects of teeth

Nos. 8 and 9 and light-cured using an LED curing light (UltraLume 5, Ultradent Products, Inc). Next, a thin layer of the enamel-shaded composite was applied, shaped, and sculpted into place, then light-cured from multiple directions for 20 seconds each.

Extra-fine polishing and finishing discs were used to smooth the interproximal embrasures, and the facial composite surfaces of teeth Nos. 8 and 9 were smoothed using a Jiffy polisher (Ultradent Products, Inc). Additional necessary finishing was completed using a Jiffy polishing cup (Ultradent Products, Inc). A 0.5 μm diamond grit polishing paste and goat hair wheel were used to create the final luster of the enamel composite. After polishing, a caliper was used to verify the geometric and anatomical symmetry between teeth Nos. 8 and 9.

Conclusion

As a clinician and dental artisan, it's an exciting time to address a patient's esthetic challenges in minimally invasive ways that require creatively planned treatment solutions (Figures 14 and 15). In the case presented, the

author embraced the creative restorative challenges of changing the dimensions of the patient's teeth, altering their color, and correcting interdental space discrepancies rather than outsourcing them for the fabrication of indirect restorations that would require reduction dentistry. ©

Disclosure

Dr. Milnar has received financial and materials/product support from Ultradent Products, Inc.

Product References

Products: Opalescence Trèswhite Supreme, Vit-I-escence, UltraEtch, Peak LC Bond, UltraLume 5, Jiffy polisher, Jiffy polishing cup
Manufacturer: Ultradent Products, Inc
Location: South Jordan, Utah
Phone: 888.230.1420
Web site: www.ultradent.com

Products: Vita Classic Shade Guide, EasyShade
Manufacturer: Vident
Location: Brea, California
Phone: 800.828.3839
Web site: www.vident.com

Product: yellow-stripe diamond
Manufacturer: Brasseler USA
Location: Savannah, Georgia
Phone: 800.841.4522
Web site: www.brasselerusa.com

References

1. Schmidt CJ, Tatum SA. Cosmetic dentistry. *Curr Opin Otolaryngol Head Neck Surg.* 2006;14(4):254-259.
2. Davis MW. Esthetic and functional incisal enameloplasty. *J Prosthet Dent.* 1997;77(6):633.
3. de Castro MV, Santos NC, Ricardo LH. Assessment of the "golden proportion" in agreeable smiles. *Quintessence Int.* 2006;37(8):597-604.
4. Matis BA. Tray whitening: what the evidence shows. *Compend Contin Educ Dent.* 2003;24(4A):354-362.
5. Croll TP, Cavanaugh RR. Augmentation of incisor width with bonded composite resin: another look. *Quintessence Int.* 1990;21(8):637-641.
6. Basting RT, Rodrigues AL Jr, Serra MC. The effects of seven carbamide peroxide bleaching agents on enamel microhardness over time. *J Am Dent Assoc.* 2003; 134(10):1335-1342.
7. Al-Qunaian TA. The effect of whitening agents on caries susceptibility of human enamel. *Oper Dent.* 2005;30(2):265-270.
8. Clark LM, Barghi N, Summitt JB, et al. Influence of fluoridated carbamide peroxide bleaching gel on enamel demineralization. ADEA/AADR/CADR Meeting and Exposition; March 8-11, 2006; Orlando, Fla.
9. Amaechi BT, Clark LM, Barghi N, et al. Enamel fluoride uptake from fluoridated carbamide peroxide bleaching gel. ADEA/AADR/CADR Meeting and Exposition; March 8-11, 2006; Orlando, Fla.
10. Attin T, Hannig C, Wiegand A, et al. Effect of bleaching on restorative materials and restorations—a systematic review. *Dent Mater.* 2004;20(9):852-861.
11. Josey AL, Meyers IA, Romaniuk K, et al. The effect of a vital bleaching technique on enamel surface morphology and the bonding of composite resin to enamel. *J Oral Rehabil.* 1996;23(4):244-250.
12. Da Silva Machado J, Cândido MS, Sundfeld RH, et al. The influence of time interval between bleaching and enamel bonding. *J Esthet Restor Dent.* 2007;19(2):111-118.
13. Buonocore MG. A simple method of increasing the adhesion of acrylic filling materials to enamel surfaces. *J Dent Res.* 1955;34:849-853.
14. Brudevold F, Buonocore M, Wileman W. A report on a resin composition capable of bonding to human dentin surfaces. *J Dent Res.* 1956;35:846-851.
15. Buonocore MG, Quigley M. Bonding of synthetic resin material to human dentin: preliminary histological study of the bond area. *J Am Dent Assoc.* 1958;57:807-811.
16. Heymann HO, Hershey HG. Use of composite resin for restorative and orthodontic correction of anterior interdental spacing. *J Prosthet Dent.* 1985; 53(6):766-771.
17. Torney DL, Denehy GE, Teixeira LC. The acid-etch class III composite resin restoration. *J Prosthet Dent.* 1977;38(6):623-626.

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1. **All-at-once treatments (eg, veneers, crowns, or other indirect restorations):**
 - a. are less expensive.
 - b. leave little room for reversibility.
 - c. require some variation of enamel-etching procedure.
 - d. will work in areas of periodontal pocketing.
2. **In this case, which characteristics of the patient's anterior teeth were observed?**
 - a. morphological
 - b. occlusal
 - c. optical
 - d. all of the above
3. **In this case, what type of treatment plan was developed to esthetically alter the patient's smile?**
 - a. One that required preliminary periodontal treatment.
 - b. One that required preliminary orthodontic treatment.
 - c. 3-fold
 - d. provisional
4. **In this case, what would be performed so that the resulting tooth length and shape would appear to match and complement the overall appearance of the patient's face?**
 - a. enameloplasty
 - b. vital tooth bleaching
 - c. reversible composite incisal lengthening
 - d. veneer incisal lengthening
5. **What was used to measure the height of the central incisors?**
 - a. digital image enhancement
 - b. laser guide
 - c. perio probe
 - d. caliper
6. **The Golden Proportion is which ratio?**
 - a. width-to-height
 - b. height-to-length
 - c. length-to-diagonal
 - d. diagonal-to-depth
7. **Regardless of changes in formulations and delivery systems, the efficacy of vital tooth bleaching depends on:**
 - a. tooth surfaces being in direct contact.
 - b. the appropriate concentration of active whitening agent.
 - c. the specific time of contact between the tooth surfaces and the whitening agent.
 - d. all of the above
8. **At least how many days should be allowed between enamel bleaching and the placement of adhesive bonding agents/composite resin restorations?**
 - a. 1
 - b. 7
 - c. 14
 - d. 30
9. **In this case, the ultrafine preparation extended 1 mm onto the facial surfaces:**
 - a. because of localized enamel hypoplastic white spots.
 - b. because of the football shape of the bur.
 - c. because of the round shape of the bur.
 - d. to blend the material into natural enamel.
10. **Because the patient exhibited Class 1 occlusion:**
 - a. a thorough lip line comparison with anterior teeth was not performed.
 - b. no lingual preparation was necessary.
 - c. oral hygiene instruction was relatively easy.
 - d. the vertical dimension of occlusion was not reduced.

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