

Out of the Darkness: Restoring the Tetracycline-Stained Smile



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[QA: Figure captions were not provided so they were taken from the text. Please review and make any necessary changes to them.]

Restoring the tetracycline-stained smile into one that looks lifelike is one of the most difficult endeavors in cosmetic dentistry. Because the dentin is so deeply stained in most cases, achieving a stain-free smile is difficult and the result is often seen as opacous. [QA: Ok as edited?] A “blocked-out” appearance is challenging at the very least (Figures 1 and 2).

Although whitening systems have become very effective at

lightening the gray banding seen in tetracycline-stained teeth,¹ often veneers are still required to completely disguise the darkness. Unfortunately, it is common to see a rebound of graying only months after whitening the teeth.

Preparation design is the most important clinical parameter when restoring dark-stained teeth. There has been a lot of discussion about preparation design in the literature published in recent years. [QA: Please provide reference(s).] Promoters of “minimal-to-no preparation” design (sometimes referred to as contact lens preparation) certainly have valid points when talking about routine cosmetic enhancement.^{2,3} In most tetracycline cases, however, ample tooth reduction is necessary to achieve predictable esthetic results. This allows the needed room for the ceramist to create

natural-looking veneers.

CASE REPORT

This patient, a 45-year-old woman, has long thought about “fixing her smile” but feared she would end up with that undesirable, “covered-up” appearance.

The patient had numerous old, defective amalgam/crown restorations on the posteriors as well as several discolored anterior composite resin fillings (Figures 3 through 5). She had a fairly normal molar-to-molar relationship, but heavy wear facets coupled with shortened crown heights indicated a long history of bruxism.⁴ This was confirmed by the patient. She has experienced joint/muscle soreness for many years, and even complained about radiating back and arm pain she felt was connected to her bruxism habit. A 1-mm CR-CO [QA: Centric relation/centric occlusion?] slide, leading to an open anterior bite relationship with posterior group function, was also noted (Figure 6). Full-mouth rehabilitation was indicated and accepted by the patient.

After a detailed discussion about expectations and desired results, a diagnostic wax-up was completed and presented to the patient. Incidentally, although not employed here, this is where digital imaging would enhance

the presentation. Creating an anterior overbite of 1.5 mm and providing cuspid-guided occlusion were two of the restorative goals. Of course, creating a natural, beautiful smile was the ultimate esthetic goal.

Occlusal Analysis

In line with the teachings of Frank Spear and other gnathologically guided dentists,⁵ [QA: Please provide additional references.] gold crowns were selected for the second molars, ceramogold crowns on all other posteriors, and all-ceramic veneer crowns on the anteriors. A protective night-guard would follow cementation of the final restorations.

The discussions over restoration types and their effects on occlusion are an ongoing debate in dentistry. Although there are several different philosophies on occlusion, they all share some common threads, which explains why most approaches seem to have a high amount of success. For instance, most dentists would agree that in most occlusal situations, the ideal occlusal scheme would be one that is cuspid-guided with no posterior excursive contacts. Gnathologists and myotronicists alike would agree on this fundamental standard. [QA: Please provide reference.] On the other



Figures 1 and 2—Because the dentin is so deeply stained in most cases, achieving a stain-free smile is difficult and the result is often seen as opacous.



Figures 3 through 5—The patient had numerous old, defective amalgam/crown restorations on the posteriors as well as several discolored anterior composite resin fillings.



Figure 6—A 1-mm CR-CO slide, leading to an open anterior bite relationship with posterior group function, was also noted.

hand, the debate over where the condyles should be when the patient closes [QA: closes his or her mouth?], or how changes in vertical dimension affect proprioception and occlusal stability will likely remain steeped in controversy for many years.[QA: Please provide reference.] Because there can be more than

one way to establish a sound occlusion, the dentist needs to carefully tailor an occlusal plan to each individual. Assessing the patient's bite excursions, the amount of wear on the teeth, the vertical dimension, the anterior pathway, smile lines, and curves (Spee, Monson [QA: Explain?]) are all extremely important in

establishing a successful outcome.[QA: Please provide reference.] In full-mouth rehabilitation cases, all of these considerations are critical to avoiding pitfalls.

Whichever occlusal philosophy one follows, experience will always be the ultimate teacher. Having a low remake percentage should be a priority among

restorative dentists. Again, careful evaluation and planning will ultimately provide the best opportunity to achieve restorative success. In this particular case, function, stability, and esthetics were all equally considered before deciding on restoration choices.

Preparation

[QA: Would be helpful to provide a small introduction here regarding the use of bleach as a pretreatment to assist with the outcome of the veneers.]

Having a low remake percentage should be a priority among restorative dentists.

The patient performed home whitening for 6 weeks. Although the teeth did lighten somewhat, the patient desired a color that whitening would not provide. Furthermore, she wanted to change contours and add some length to her incisors. Excessive wear on her incisors created a reverse smile line, which would be corrected with the new veneers.

Shade selection was determined using several factors.⁶ In cases such as this where there is a clean palette, so to speak, several factors need to be evaluated when choosing a suitable color. The patient's skin color, hair color, lip color, and expectations are all important parameters to consider. This patient desired to have teeth as white as possible without creating that obvious "Hollywood-white" smile. It was agreed that A2-gingival with A1-incisal would match her features nicely, and still provide a natural appearance.

Numerous 35-mm photographs [QA: Do you mean slides?] were provided to the ceramist including preoperatives, preparations, stump shades, and full-face shots. Kodak Elite 100 Slide Film (Eastman Kodak Co.) is an excellent film for intraoral



Figure 7—By tucking the margins interproximally to the mesio/distolingual line angles, the practitioner provides the necessary room for the ceramist to create natural contours.



Figure 8—Transitional composite resin veneers were spot bonded with a flowable composite resin.



Figure 9—The transitional porcelain veneers are still somewhat flat in appearance and appear slightly gray in color.

pictures. Stump shades are required for all anterior cases but play an especially critical role in tetracycline cases when communicating with the laboratory. The technician needs to know if any block-out is required to provide a natural color transformation.

Anterior Preparations

The anterior teeth were prepared first. Approximately 0.8 mm was removed from the facial, and removal of enamel interproximally was performed to create room for natural porcelain contours. By tucking the margins interproximally to the mesio/distolingual line angles, the practitioner provides the necessary room for the ceramist to create natural contours⁷ (Figure 7). [QA: Is figure 7 reprinted from Reference 7?] In tetracycline

cases such as this one, this design is absolutely necessary to completely block that gray look that still resides when covering the facials only. All gingival margins were placed right at or slightly below the gum line.

Very little incisal reduction of the upper incisors was necessary here as a result of the open bite. Approximately 0.75 mm was

removed from the lower incisal edges. Gingival recontouring was selectively performed (mandibular incisors, teeth Nos. 23 through 25) with electrosurgery to help create harmonious gingival symmetry.⁸ A retraction cord was placed and impressions were made. Transitional composite resin veneers were spot bonded (Figure 8) with a flowable com-

posite resin (PermaFlo®, Ultradent Products, Inc). These transitionals can be made from acrylic resin (all connected but contoured to appear individualized) or from composite resin.

Provisionalization

Two weeks later, transitional feldspathic veneers were spot bonded into place. This is an extra

Case Study continued

step that is usually not necessary. Good wax-up after excellent temporaries is usually enough. However, when making such a big color shift from dark gray to a bright white smile, a mid-range color transition can make the transformation smoother.

The transitional porcelain veneers are still somewhat flat in

appearance and appear slightly gray in color (Figure 9). Excessive incisal translucency, although not requested, maintained some of the gray hues. These provisionals would provide a good template for the ceramist to create the final restorations. The patient was asked to wear these throughout

the posterior restoration phase. She would then be able to describe whatever modifications she wanted.

Posterior Preparations

Careful removal of the old restorations was performed under a rubber dam. Composite resin cores were placed (PermaFlo®

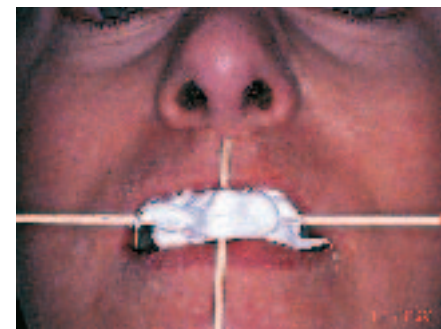


Figure 10—A “modified” face-bow transfer was made—this simple cross-stick bite provides the laboratory with the midline of the face, as well as the approximate zygomatic/orbital angle.

base layer; Z100, 3M™ ESPE™) and preparations completed. Impressions were taken and acrylic resin temporaries (Jet®, Lang Dental Manufacturing Co., Inc.) were cemented. A “modified” face-bow transfer was made—this simple cross-stick bite provides the laboratory with the midline of the face, as well as the approximate zygomatic/orbital angle (Figure 10). Posterior bite registrations were made, and a Denar face-bow transfer was also provided for laboratory confirmation.

Cementation

The posterior crowns were fitted and cemented with Fuji I CEM™ (GC America, Inc.). This glass-ionomer cement was chosen because it has excellent retention, was easy to mix, and was easy to clean away. Bite excursions were checked, slight bite adjustments were made, and it was now time to revisit the anterior teeth.

Permanent Anteriors

Removal of the provisional porcelain veneers was done and preparations were refined. Because the veneers were spot-bonded, removal was very quick and easy. The patient was happy with the established overjet and overlap of the provisionals. She just wanted the color changed to the planned A1/A2 shade.

Slight refinements to the preparations were made, impressions taken, and provisionals were again spot bonded to place. Three weeks later, the permanent veneers were ready to be bonded. IPS Empress® (Ivoclar Vivadent®, Inc.) was chosen for the anteriors in this particular case. IPS

Case Study continued



Figures 11 through 22—[QA: Please provide captions for the remaining figures.]



Figure 12



Figure 13



Figure 14



Figure 15



Figure 16



Figure 17



Figure 18



Figure 19



Figure 20



Figure 21



Figure 22

Empress® provides beautiful color and luster with excellent light transmission. In addition, the wear profile of IPS Empress® may be nearly equal to that of enamel.⁹ The veneers were bonded with Lute-it® Universal (Pentron® Laboratory Technologies) and Bond 1® (Pentron® Laboratory Technologies). No block-out resin was used in this case although Renamel® (Cosmedent®, Inc.) is excellent, but because enough reduction was provided, the ceramist was able to create truly beautiful veneers. The patient was thrilled with the results, and felt the entire process, which entailed about 6 months, was worthwhile (Figures 11 through 22).

CONCLUSION

Restoring a dark smile to one that is bright and natural in appearance is always challenging. Preparation design, patient expectations, facial features, and of course, finances are some of

the more important parameters to consider when undertaking a restorative-cosmetic case such as this one. Spending time with case preparation and presentation to the patient is absolutely critical to achieving a successful outcome. Patient expectations, along with what the restorative dentist and the ceramist can create, need to be in harmony with one another.

Incidentally, the patient has expressed that she no longer experiences any jaw pain, that she smiles more than she ever has in her life, and that she enjoys an improved self-image. All this for a smile. ○

ACKNOWLEDGMENT

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REFERENCES

1. Haywood VB, Leonard RH, Dickinson GL. Efficacy of six months of night guard vital bleaching of tetracy-

2. cline-stained teeth. *J Esthetic Dent.* 1997;9:13-29.
3. Ibsen RL, Strassler HE. An innovative method for fixed anterior tooth replacement utilizing porcelain veneers. *Quintessence Int.* 1986;17:455-459.
4. Nash RW. Minimal preparation as an option with porcelain veneers. *Dent Today.* 1992;11. [QA: Please verify this reference. No record of it in *Dentistry Today* and please provide page numbers.]
5. Dawson PE. *Diagnosis and treatment of occlusal problems.* 2nd ed. St. Louis: CV Mosby Co.; 1989.
6. Spear F. A conversation with Dr. Frank Spear. *Dent Practice Report.* 2002;10:42-48.
7. Ahmad I. Three-dimensional shade analysis: per-

8. spectives of color—Part 1. *Pract Periodontics Aesthet Dent.* 1999;11:789-796.
9. Pacquette JM. Bonded porcelain restorations: an integral part of aesthetic rehabilitative dentistry. *Dent Today.* 2002;21:78-85.
10. Robbins JW. Esthetic gingival recontouring—Caveat Emptor. *Contemporary Esthetics and Restorative Practice.* 2002;6:66-74.
11. Heinzmann JL, Krejci I, Lutz F, et al. Wear and marginal adaptation of glass ceramic inlays, amalgam and enamel. *J Prosthet Dent.* 1993;69:425-430.

Product References

Product: Kodak Elite 100 Slide Film
Manufacturer: Eastman Kodak Company
Address: 343 State Street
Rochester, New York 14650
Phone: 800.933.8031
Fax: 800.374.1871

Product: PermaFlo®
Manufacturer: Ultradent Products, Inc.
Address: 505 W. 10200 South
South Jordan, Utah 84095
Phone: 800.552.5512
Fax: 801.553.4600

Product: Z100
Manufacturer: 3M™ ESPE™
Address: Bldg. 275-25E-03
St. Paul, Minnesota 55144
Phone: 800.634.2249
Fax: 612.733.2481

Product: Jet®
Manufacturer: Lang Dental Manufacturing
Co., Inc.
Address: 175 Messner Drive
Wheeling, Illinois 60090
Phone: 800.222.5264
Fax: 708.215.6678

Product: Fuji 1 CEM™
Manufacturer: GC America, Inc.
Address: 3737 West 127th Street
Alsip, Illinois 60803
Phone: 800.323.7063
Fax: 800.423.2963

Product: IPS Empress®
Manufacturer: Ivoclar Vivadent®, Inc.
Address: 175 Pineview Drive
Amherst, New York 14228
Phone: 800.533.6825
Fax: 716.691.2285

Product: Lute-It® Universal, Bond 1®
Manufacturer: Pentron® Laboratory
Technologies
Address: P.O. Box 724
125 North Plains Industrial
Road
Wallingford, Connecticut 06492
Phone: 800.551.0283
Fax: 877.677.8844

Product: Renamel®
Manufacturer: Cosmedent®, Inc.
Address: 401 North Michigan Avenue
Suite 2500
Chicago, Illinois 60611
Phone: 800.621.6729

