

Resolving Color Variation



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CASE REPORT

Diagnosis and Treatment Planning

The patient presented to our office with a list of complaints about the appearance of his teeth. Developmental and environmental enamel defects and hypocalcification had affected the hue, value, and chroma of the mid-facial regions of his dentition (Figure 1). The overall color variation of his teeth was too dark, and he had asymmetrical gingival zenith variations (Figure 2). The appearance of tooth color is a complex phenomenon, with numerous factors such as lighting conditions, translucency, opacity, light scattering, gloss, and the human eye and brain influencing the overall perception of tooth color.¹ His low smile-line and lip-line were in balance; however, this patient desired a more normalized and aesthetic smile.

Using Dr. Paschal Magne's aesthetic fundamental objective criteria and aesthetic checklist, it was determined that the zenith of gingival contours and balance of gingival levels for teeth Nos. 8 and 9 were too apical, while the zeniths for teeth Nos. 4 and 13 were not positioned apically enough.^{2,3} Generalized enamel color variation at the mid-facial one third was optically and aesthetically distracting, with an old PFM crown on tooth No. 8 demonstrating the greatest variation in color.

The full-facial view and the retracted anterior view (Figures 1 and 2c) show an arch curvature and incisal edge position that harmonizes with the lower lip-line. Some old dental work can be seen, along with the discolored and unnaturally opaque PFM on tooth No. 8.

Our treatment plan was to start with the preparation of 10 maxillary teeth, with 2 full porcelain crowns (Nos. 5 and 8) and 8 veneers (Nos. 4, 6, 7, and Nos. 9 to 13), concluding with the preparation of 10 mandibular veneers (Nos. 20 to 29). The patient was not concerned with his gingival zenith asymmetry due to his low smile-line and did not wish to correct this aesthetic issue.

Clinical Protocol

During the preparation of the maxillary teeth, folded 2-x-2 gauze was placed in the vestibule to prevent the enamel and porcelain slurry from denuding the facial gingiva during tooth preparation. A depth-cut technique was used with a goal of 0.8-mm facial reduction, utilizing a 0.5-mm depth cut diamond (No. 900-7136 [Henry Schein]). (Although not shown here, we usually mark the depth of the initial cut with a permanent marker, as this is the most accurate method to ensure a specific reduction.) The old PFM crown on tooth No. 8 was removed and tooth structure reduced to the 0.5-mm depth cut with a round-ended diamond (No. 112-5161 [Henry Schein]). The discolored dentin on tooth No. 8 was excavated and replaced with a hybrid composite resin (Renamel [Cosmedent]) to conceal the discolored dentin.⁴ A 0.3-mm depth cut diamond (No. 900-7135 [Henry Schein]) was then used to achieve a total reduction of 0.8 mm, using the round-ended diamond to reduce the last 0.3 mm of tooth structure. Since our target reduction was 1.5 mm and the round-ended diamond has a diameter of 0.75 mm at the tip, our protocol was to sink this diamond to twice its tip diameter to ensure a



Figure 1. Frontal view demonstrating variations in color.

1.5-mm reduction. To finalize the preparations, all of the external line angles were removed and then the preps were polished using a diamond (No. 8878K-31 [Brasseler USA]) (Figure 3). O-Bite (DMG America) bite registration material was used to capture the vertical dimension of occlusion (VDO) in addition to a centric relation (CR) bite. The molars were in contact at the maximum closed position as the O-Bite captured this position of maximal closure in the CR position (Figure 4). The temporization phase began with spot etching (Etch-Rite 38% phosphoric acid gel [Pulpdent]) the dentin of teeth Nos. 6, 8, 9, and 11 for 20 seconds and the teeth were washed thoroughly and air-dried. Next, 2 coats of a desensitizer (Dentin Desensitizer [Pulpdent]) were

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Figure 2a. Right lateral view showing malformed enamel.



Figure 2b. Left lateral view showing variations in gingival zenith.



Figure 2c. Frontal view showing pretreatment condition of dentition.

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applied. Then, an adhesive (OptiBond FL [Kerr]) was applied and air-thinned (according to the manufacturer's instructions) to evaporate out the solvent. Figures 5 to 7 show utilization of Dr. Bob Nixon's temporization technique (Cosmedent). This rubber-like Rapid Simplified Veneer Provisionals (RSVP) material from Cosmedent has been adapted to the master wax-up to capture all aesthetic and functional lingual and incisal contours. The gingival one third of the facial aspect of the RSVP material has been removed and RSVP low viscosity incisal composite resin (Cosmedent) was placed into the matrix. The low viscosity incisal composite resin was then light-cured (Rembrandt Sapphire Plasma Arc curing light [DenMat]), leaving the operator to hand place and contour the RSVP high viscosity cervical composite resin to the facial margins with accuracy. The initial amount of RSVP low viscosity incisal composite resin was placed to construct the exact location of the incisal edge and lingual aspect of these teeth. The aesthetic contours and functional nature of the temporary were evident. Another advantage with this system is its ease of adding color, characterization, and a glazed finish. A Kolor + Plus (Kerr) kit was utilized to add ochre and white spots, along with LuxaGlaze (DMG America) (Figure 7).

The final restorations were fabricated by our lab team using a very strong and aesthetic leucite-reinforced porcelain system (Authentic [Ceramay Dental]). This ceramic system was chosen due to being one of the strongest pressable porcelains available and the advantage of the availability of the material in a Plus/Plus (++) shaded ingot. This was ideal for blocking out any discoloration and variations in shades of teeth. Notice, in Figure 8, how similar they are to the temporaries, and how closely the final restorations fit the dies. A cut-back technique was utilized by the dental laboratory technician to achieve the illusion of translucency and to incorporate a halo effect necessary to create a natural-looking incisal edge (Figure 9).

At the appointment for the delivery of the final restorations, the provisionals were removed. This was done by cutting down the entire facial aspect of the temporary with a round-ended diamond bur, placing a crown splitter into the slot and torquing, thereby breaking the cement bond and dislodging the provisionals. Via excellent home hygiene, the patient in this case



Figure 3. Frontal view of completed maxillary preparations.



Figure 4. Frontal view of O-Bite (DMG America) capturing maximum closure in centric relation position.



Figure 5. Dr. Bob Nixon's temporization technique (Cosmedent) was utilized.



Figure 6. Low viscosity incisal composite resin (RSVP [Cosmedent]) captures incisal edges.



Figure 7. Frontal view of finalized temporaries.



Figure 8. Notice how tightly and well the restorations fit all the dies.



Figure 9. One week after insertion of maxillary restorations.



Figure 10. Frontal view of completed mandibular preparations with polishing of the incisal one third.



Figure 11a. Right lateral view of restorations in place.



Figure 11b. Left lateral view of completed restorations.



Figure 11c. Frontal view of all restorations bonded into place.



Before Image. Frontal view of patient before treatment.



After Image. Frontal view of completed case. An extremely pleased and happy patient!

had created a perfect environment for cementation of the restorations. If a patient presents with poor oral hygiene habits, it is best to have him or her rinse (or brush) with a solution of 0.12% chlorhexidine gluconate (Acclean [Henry Schein]) during the time the provisionals are in place. The maxillary restorations were resin bonded into position using a 4th generation bonding adhesive (OptiBond FL) in combination with an aesthetic resin cement (Calibra Esthetic Resin Cement [Dentsply Sirona]).

Proper finishing of restorations is essential for long-term success. Three burs were used to initiate the finishing process: first, a red-striped, 30-grit diamond (Brasseler USA) was used

Another advantage with this system is its ease of adding color, characterization, and a glazed finish.

around all margins; followed by a yellow-striped, 15-grit diamond (Brasseler USA); and then a white-striped, 30-bladed finishing bur (Brasseler USA). Next, 3 Shofu Dental polishing points were used, starting with the no-stripe point, then the yellow-striped, and last the white-striped polishing point. The interproximal finishing began utilizing a CeriSaw (DenMat) to first clear out excess cement in the interproximal areas, then a red-striped Gateway Flexi diamond strip (Brasseler USA) was used to smooth each interproximal surface. The last and most significant interproximal polishing was achieved with a series of EPITEX Strips (GC America). After the blue, green, gray, and tan strips were all used in sequence (according to the manufacturer's directions) completing the polishing, the final step in the delivery sequence, flossing between the teeth, was extremely smooth. Figure 9 shows one-week post insertion. Notice the natural incisal translucency and halo.

In the next phase of treatment, the preparation of the mandibular teeth was done. We wanted a total facial reduction of 0.8 mm and incisal edge reduction of 1.5 mm. We accomplished this with the same sequence of depth cuts and burs as we utilized to prepare the maxillary dentition. All external line angles were rounded and the preps are polished with a NTI CeraGlaze (Kerr) ultrahigh-shine yellow polishing point (Figure 10). All of the mandibular temporaries were fabricated and color matched to the maxillary restorations. The 10 mandibular veneer restorations for teeth Nos. 20 to 29 were created by our lab team in the same manner, with the same pressed leucite-reinforced porcelain (Authentic) as the maxillary restorations. Finally, all the mandibular restorations were bonded into position (as described above using a light-cured resin cement technique for these veneers), achieving the desired tooth color and form (Figure 11). One can

immediately see from the patient's facial expression that he was extremely pleased with the results of a much more harmonious and aesthetic smile (Before and After Images).

CLOSING COMMENTS

Treating aesthetic cases can be quite rewarding for the clinician and fulfilling for the patient. This patient presented with a list of complaints about the appearance of his teeth. The

majority of his concerns were with the mid-facial malformation and discoloration of the majority of his teeth. We were able to correct these aesthetic concerns, bringing harmony to his smile. ♦

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