



A Multifactorial Approach to Restorative Dentistry

Providing the right treatment solutions by addressing hidden factors

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Often patients present with numerous complications and factors that affect successful esthetic treatment. If all factors present are not treated, a clinician can make improvements, but the case will not be ultimately successful. Identifying all of these factors and involving the patient with these treatment goals is essential.¹⁻³ In addition to esthetic factors such as the spacing and color of teeth and gingival display, the planes of occlusion constitutes a “hidden” esthetic factor that must be addressed when redesigning a smile.

Case Presentation

The patient in the case presented with two concerns—the spaces between a number of his teeth and the shade of teeth Nos. 8 and 9 (Figure 1). Several other esthetic issues were discovered during examination, however. These included wide variations in the value,

hue, and chroma of other teeth, and the fact that there were no reliable landmarks upon which to rebuild his smile.⁴ This patient’s career in corporate public relations required daily face-to-face meetings and interactions with new clients. First impressions were key to his career, and he understood the power and importance of Dale Carnegie’s concept of how a smile can “win friends and influence people.”⁵

Diagnosis and Treatment Planning

The spacing between this patient’s teeth brings up the concept of duality, an ophthalmic physiologic principle. It holds that if two objects are of equal size and close together but do not touch, the eyes do not know which object to focus on, so they bounce back and forth between both objects in confusion. The way to resolve this situation is either to make the two objects different colors or to bring them together.

A close-up of the spacing is shown in Figure 2. As previously mentioned, the variations in

the hue, value, and chroma of the teeth were a problem, as was the gingival recession on crowns Nos. 8 and 9. Root canal treatment on No. 8 resulted in extremely dark cementum in the area of the recession that showed through the gingival tissue. Compared to how natural teeth reflect light, the unnatural opacity of the porcelain-fused-to-metal crowns on teeth Nos. 8 and 9 added to the unesthetic look of his smile.

One of the first steps in establishing an esthetic reconstruction is to define the proper plane of occlusion.⁶ According to Dawson, “The form of the occlusal plane is directly related to specific functional requirements, alignment of teeth in relationship to the arc of closure for best resistance to loading and ease of access for positioning of the food on the occlusal surface.”⁷ Without a proper plane of occlusion, the remaining features that establish proper form and function are adversely affected. Embrasures will not be perpendicular



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FIG. 1



FIG. 2

(1.) Full-face view demonstrating presence of diastemata and shade variation. (2.) Frontal view showing spacing and shade variation.

to the proper plane of occlusion, and all tooth dimensions will be nonconforming. Therefore, it is essential to find some way of establishing and transferring the proper plane of occlusion to the laboratory technician.

Clinical Protocol

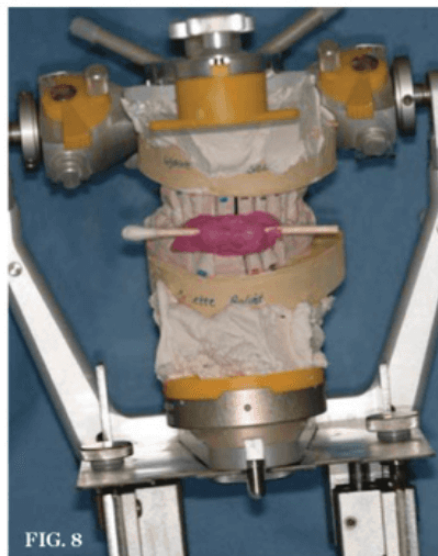
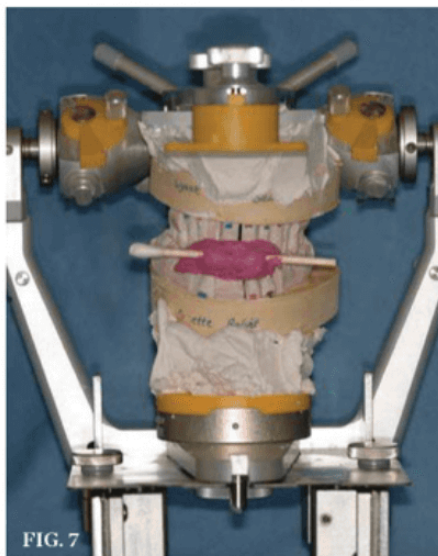
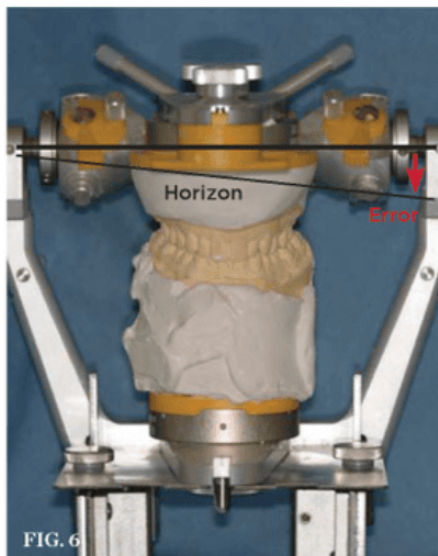
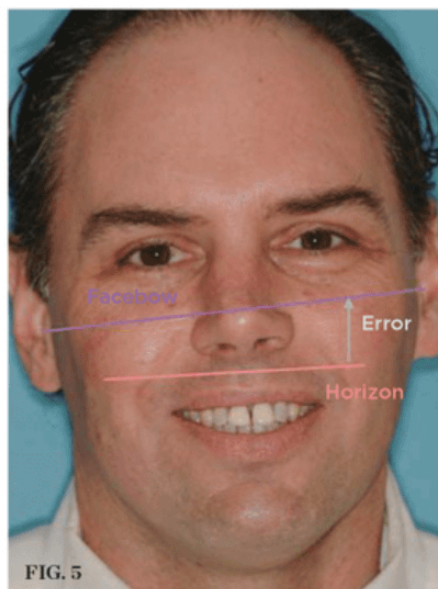
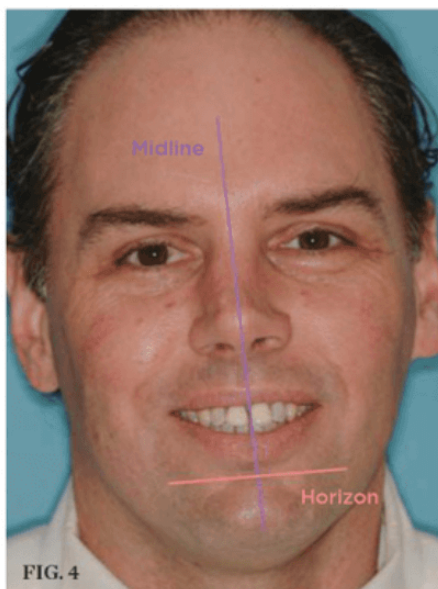
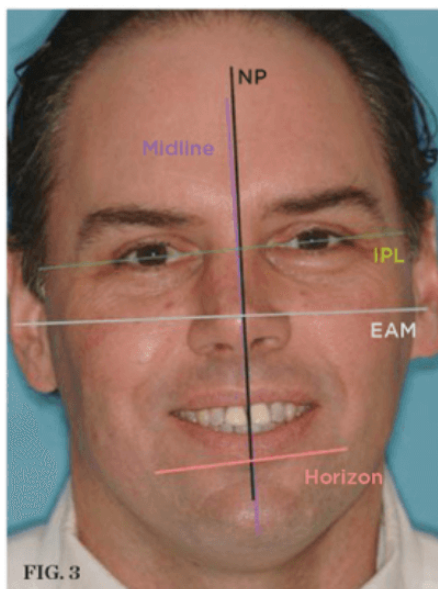
A number of techniques are available for capturing and relating to the laboratory

technician the proper plane of occlusion.⁸ A properly taken face-bow is the most trusted method of relating the plane of occlusion, as long as the external auditory meatuses are symmetrical. Other methods include establishing the plane parallel to the interpupillary line, making the plane perpendicular to the nasion-philtrum (N-P) line, and using a stick bite. Technicians prefer to have the incisal edges of preparations and temporary restorations parallel to the plane of occlusion.

In studying landmarks on this patient, the authors discovered that the external auditory

meatuses and his interpupillary line were not in the same plane (Figure 3). His right orbit was lower than his left orbit, and his nose was canted slightly to the right. All of these factors contributed to the complexity of beginning this case. This skeletal asymmetry caused a canting up of the maxilla on the patient's left side (Figure 4).

The authors' goal was to select a midline more perpendicular to the horizon and more in balance with his face. By taking a proper face-bow transfer with one external auditory meatus lower than the other, the mounted



(3.) The external auditory meatuses and interpupillary lines are not parallel to the horizon. (4.) Variations with midline, horizon, and facial landmarks. (5.) Facial view showing the error when a face-bow is taken in a situation where the external auditory meatus is higher on one side. (6.) Error when external auditory meatus variations are transferred to SAM III articulator. (7.) Stick bite is placed on the teeth mounted with external auditory meatus error. (8.) Stick bite made parallel to horizon with Wynne 2003.

Restorative

cast will be lower on the side with the higher external meatus (Figure 5 and Figure 6). By using the Wynne 2003 articulator occlusal plane augments developed by the authors with a stick bite, this error can be corrected. The Wynne 2003 is a prototype developed for the Sam[®] III articulator (Great Lakes Orthodontics, www.greatlakesortho.com). It is not commercially available, but was designed to aid in tipping the Sam III articulator to correct the position of the occlusal plane. In combination with the stick bite, it can be used to simulate the correct position of occlusal plane. Any device that can be attached to the base of the articulator and enable the clinician to tilt the entire articulator until the stick bite is parallel to the horizon will accomplish this goal.

The stick bite is placed with the patient standing and oriented to capture the horizontal

plane as it relates to the patient's face. In this patient's situation, it was very close to being perpendicular to his N-P line. This occlusal plane is the most esthetic and in balance with more of his facial structures. To relate this to the laboratory technician, the authors placed the stick bite on the model

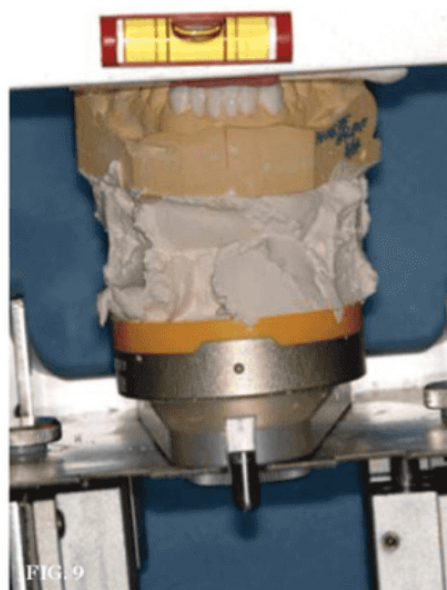
“Each step of the preparation must be measured for accuracy.”

and elevated the right side of the articulator until the stick bite was parallel to the floor or horizon (Figure 7 through Figure 9). It would be possible to correct the face-bow by taking it out of the lower ear and elevating it until it was in the same plane as the left ear. However, this is not as accurate, since the

face-bow assembly covers the visual center of the face to be balanced.

The Wynne 2003 is capable of adjusting both sides to tip the articulator until it brings the stick bite into position parallel to the floor. This device corrects the landmark error or external auditory meatus discrepancy. In addition, it transfers the corrected midline to the orientation of the new occlusal plane. The only caution is that the laboratory technician should ignore the tilted articulator and instead focus on the occlusal plane as it relates to the bench top or horizon. A diagnostic wax-up of his case was completed demonstrating how the diastemata have been removed without making the teeth look too wide (Figure 10).

Each step of the preparation must be measured for accuracy. If the facial reduction requires 0.8 mm, the clinician will make a 0.5-mm depth cut with a 0.5-mm depth cutting diamond (Maxima Diamond #900-7136, Henry Schein Inc., www.henryschein.com), followed by a 0.3-mm depth cutting diamond



(9.) The level confirms that the stick bite is in the true horizontal position. (10.) Wax-up demonstrating diastemata closure. (11.) Reduction cuts are marked for accuracy with a permanent marker. When the marks are eliminated we are at the desired reduction. (12.) Facial reduction of 0.8 mm. (13.) Incisal edge reduction of 1.5 mm, twice the 0.75 diameter of the round-ended diamond.

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(Maxima Diamond #900-7135, Henry Schein). Each reduction is marked with a permanent marker to assure removal of the desired amount of tooth structure (Figure 11 through Figure 13). As a 1.5-mm incisal reduction was desired in this case, the authors sank a 0.75-mm diameter diamond bur twice its diameter to get the desired reduction (Figure 14). Finally, they went through the contact area and smoothed all external line angles using a diamond shank 31, 8878k (Brasseler USA, www.brasseler.com) (Figure 15).

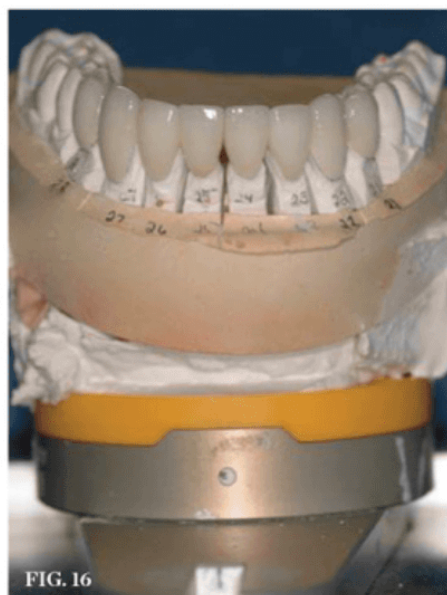
The completed mandibular restorations—two full crown restorations (teeth Nos. 24 and 25) and six veneers (teeth Nos. 21, 22, 23, 26, 27, and 28)—were fabricated using the Authentic[®] pressable ceramic system (Jensen Dental, <http://jensendental.com>) (Figure 16). This ceramic system was chosen because it is one of the strongest leucite-reinforced pressable porcelains available and it is available in a plus plus ingot. This was ideal for blocking out discolorations like the variation in the shades of his teeth. Figure 17

shows the mandibular restorations in place contrasted by the unprepared maxillary arch. The authors used the classical acid-etch technique to bond these restorations in place. The preparations are etched with Etch-Rite[™] 38% phosphoric acid gel (Pulpdent, www.pulpdent.com) for 20 seconds, washed thoroughly, and dried, followed by placing several coats of Dentin Desensitizer (Pulpdent). They next placed several coats of OptiBond[®] FL (Kerr Corporation, www.kerrdental.com) primer, followed by one coat of adhesive. These coats were slightly air dispersed, then light cured for 20 seconds. The restorations were cleaned with Ivoclean (Ivoclar Vivadent, www.ivoclarvivadent.com) for 20 seconds, rinsed, air dried, then one drop of Silane Primer (Kerr) was placed and air dispersed. Final cementation was completed with Calibra[®] Esthetic Resin Cement (DENTSPLY Caulk, www.dentsply.com).

Proper finishing of restorations is essential for success. Three burs were used to initiate the finishing process. First a

red-stripped 30-grit diamond (Brasseler) was used around all margins, followed by a yellow-stripped 15-grit diamond (Brasseler), and then a white-stripped 30-bladed finishing bur (Brasseler). Next, Shofu polishing points were used, starting with the no-stripe point, then the yellow-stripped, and lastly the white-stripped polishing point (Shofu, www.shofu.com). The interproximal finishing began next. A Cerisaw[™] (DenMat, www.denmat.com) was used to first clear out excess cement in the interproximal areas, then a red-stripped Gateway flex diamond strip (Brasseler) was used to smooth each interproximal surface.

The last and most significant interproximal polishing was with the series of Epitex[®] finishing strips (GC America, www.gcamerica.com). After the blue, green, gray, and tan strips were used, flossing between the teeth was extremely smooth, and the polishing sequence was complete. The mandibular teeth are usually treated first to control the incisal edge position and occlusal plane. The patient was



(14.) 1.5-mm incisal reduction completed. **(15.)** All external line angles have been rounded and polished. **(16.)** Frontal view of completed mandibular restorations. **(17.)** Frontal view of inserted mandibular restorations with untreated maxillary arch. **(18.)** Frontal view with crowns Nos. 8 and 9 removed, notice the lower value of root canal treated No. 8. Teeth Nos. 6, 7, 10, and 11 have been reduced by 0.5 mm. The black marker lines are the next reduction of 0.3 mm to reach the 0.8-mm facial reduction goal.

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brought back the next day for preparation of the maxillary arch to avoid having to live with two different shades of teeth for more than 1 day. The laterals and canines were prepared using the same burs and sequence of preparation as with the mandibular arch (Figure 18 and Figure 19). In his case, to achieve the desired total facial reduction of 0.8 mm, a 0.5-mm cut was made and followed by a 0.3-mm cut. As can be seen in Figure 24, the depth of the cut was marked with a permanent marker to ensure a precise 0.8-mm reduction.

As mentioned earlier, tooth No. 8 had endodontic treatment and presented with dark cementum in the area of recession (Figure 20). The dark color of the root surface was blocked out with Renamel[®] Microhybrid composite (Cosmedent, www.cosmedent.com) to make it more compatible with the value of the adjacent preparations (Figure 21). Hybrid composites are easy to bond to the porcelain restoration at cementation. All six maxillary preps were completed with all external line angles polished; two are full crowns (Nos. 8 and 9) and four are veneers (Nos. 6, 7, 10, and 11). Genie[®] rapid set light body VPS and Genie[®]

putty heavy body VPS (Sultan Healthcare, www.sultanhealthcare.com) were used for the final impression.

Figures 22 and 23 show all restorations in place with the proper occlusal plane, addressing the patient's chief concerns of correcting the color and diastemata condition.

Conclusion

Treating esthetic cases can often be both rewarding for the clinician and fulfilling for the patient. While treatment goals aim to completely eliminate deficits, often total deficit elimination will compromise the functional stability of the case. The lower value of the gingival third of crown No. 8 and cervical gingiva could have been raised to more closely harmonize with adjacent restorations. However, the additional axial reduction and further subgingival margin placement required to allow for extra composite thickness to block out root canal-treated tooth No. 8 would have excessively weakened the prepared tooth structure.

It is essential to be as thorough as possible during treatment planning to render a successful completion of the case. This patient voiced only two concerns, one with color and the other with the spacing between his anterior teeth. The lack of proper location

of landmarks with which to rebuild this case presented a significant dilemma. The authors were able to overcome this problem as described and completed his case to everyone's satisfaction.

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(19.) Facial view demonstrating 0.8-mm facial reduction of laterals and canines. (20.) Close up view of staining and lower value of root canal treated tooth No. 8. (21.) Renamel hybrid composite is utilized to block out the stain in tooth No. 8. (22.) Frontal view showing completed case in place. (23.) Full-face view of completed case.