Utilizing Photography and a Diagnostic Wax-Up as Pillars of Success with Porcelain Veneers

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Abstract

Patients today desire a smile in which both the teeth and healthy gums improve the overall facial esthetics. To achieve an optimal esthetic outcome, communication and treatment planning are vital. Digital photography and the diagnostic wax-up are extremely effective tools for achieving a proper level of communication between the clinician and a highly skilled laboratory technician. When using smile design principles to improve esthetics, it is critical to pay close attention to function. It is only when both esthetics and function are properly addressed that an ideal outcome can be achieved.

Key Words: diagnostic wax-up, porcelain veneers, digital photography, smile design, gingival symmetry, Accreditation Case Type I

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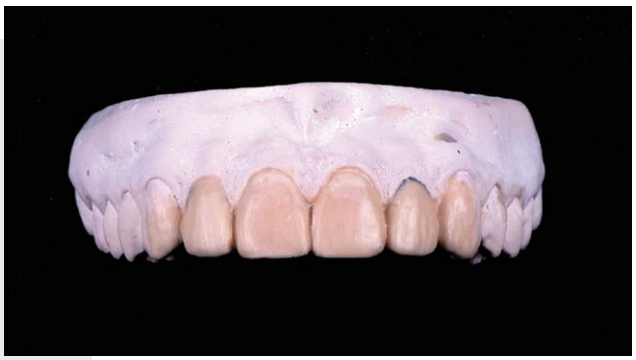

Figure 1: The diagnostic wax-up is an excellent way to communicate with the lab technician regarding the restorations' desired contour and anatomy.

Figure 2: Preoperative full-face frontal view (1:10) showing uneven and discolored bonding.

Figure 3: Preoperative frontal smile view (1:2).

Introduction

When multiple indirect restorations are being considered, an ideal end result can be realized only with a proper marriage between esthetics and function.[1] It therefore is important to take into account three different factors: the teeth, the gingival tissue, and overall facial esthetics.[2] A series of digital photographs and a diagnostic wax-up are essential for communication with the laboratory technician **(Fig 1)**. The patient's lip line and facial dynamics will determine a proper position for the teeth. Once this is established, it is important to ensure that proper function is achieved. Finally, the treatment plan should ensure that the gingival contours are idealized.

Case Presentation

Patient Complaint and History

The patient, a 24-year-old female, was unhappy with her smile **(Figs 2 & 3)**. Bonding had been completed approximately eight years prior to close spaces between the teeth due to tooth size discrepancy. The composite bonding had become chipped and stained over the past few years. The patient wanted a smile with no visible stains or chips on any of her teeth. She was not interested in more composite bonding, opting instead for treatment with porcelain veneers for a more permanent and more esthetic solution.

Evaluation, Diagnosis, and Treatment Plan

To properly evaluate and diagnose this case, the AACD series of Accreditation photographs were taken, and diagnostic models were obtained. The first step in treatment planning was to determine the incisal edge position. Based on the relationship of the patient's cuspids to the lip line in repose, the incisal edge position of the cuspids was kept where it was.[3] A proper smile line in the wax-up was created by ensuring the central incisors were not shorter than the canines.

The posterior teeth fit well with the patient's lip line and filled out the buccal corridor nicely, so they did not need to be restored. With the position of the maxillary arch established, the mandible was then evaluated to ensure that there would be no functional concerns with the new restorations.[4] Clinically, the mandibular anterior teeth showed no visible signs of wear, with mamelons present. No joint pain or pathology was noted. The patient's bite felt comfortable, with simultaneous bilateral contacts on the posterior teeth. There were no signs of any functional or parafunctional bite issues, so the current position of the teeth in the mandible was not a concern.[5]

Figure 4: The level of the gingival height can be evaluated in the preoperative retracted view (1:2).

Figure 5: Preparation design, stump shade selection, and cord packed ready for the impression.

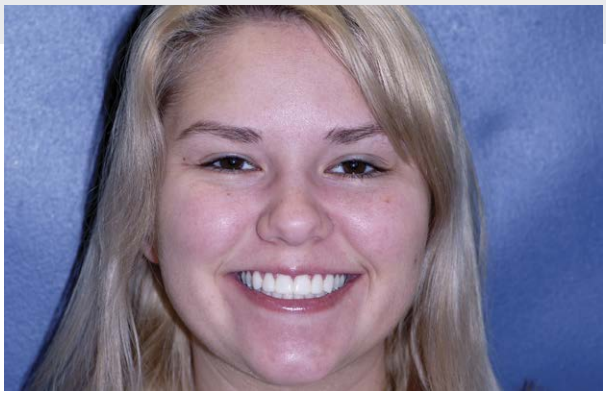

Figure 6: The temporary restorations helped give the patient an opportunity to "test drive" her new smile.

Figure 7: Retracted frontal view (1:2) of the temporary restorations, displaying well-fitting margins and symmetrical gingival contours.

The gingival heights of the maxillary anterior teeth (#6-#11) were even and in a straight pattern, with the exception of the left lateral incisor (#10). The tissue height of #10 was too low and lacked symmetry with the tissue height of #7 **(Fig 4)**. Bone sounding was completed, and it was determined that the distance from the gingival height to the bone crest on #10 was approximately 3.5 to 4.0 mm. To obtain symmetry with the gingival heights of #7 and #10, it was determined that minor closed-flap osseous recontouring would be necessary.[6]

The final phase of treatment planning involved using the diagnostic models to wax up the case. With the tooth positions and gingival heights determined, the wax-up was used to focus on proper axial inclination, embrasures, emergence profile, labial contour, and tooth proportions. The wax-up was vital, since it was used to make the provisional restorations and allowed a functional and esthetic assessment of the treatment plan before proceeding to the final restorations.[7]

Treatment

Gingival symmetry: With the diagnostic phase and wax-up complete, treatment began. Gingival symmetry was addressed first. A diode laser (Epic, Biolase; Irvine, CA) was employed to remove 2 mm from the gingival height of #10. Closed-flap osseous recontouring of the bone crest was completed with a chisel (KB-1, Brasseler; Savannah, GA).[6] The bone crest was placed 2.5 mm from the new gingival height of the contour. The diode laser was then used to idealize the shape of #7's gingival crest and to help idealize axial alignment.[8] Teeth #6-#11 were then prepared for indirect veneers (IPS e.max, Ivoclar Vivadent; Amherst, NY).[9] All the chipped and worn composite was removed. A putty guide (Flexitime, Kulzer; South Bend, IN) created from the wax-up was used to analyze the preparation depth **(Fig 5)**.[10] The gingival margins of the preparations were placed directly at the gum line. A #000 cord (Ultrapak, Ultradent Products; South Jordan, UT) was placed, and the margins were reduced an additional 0.5 mm. This ensured that the margins would be placed slightly subgingivally while not violating the biologic width.[11]

Temporaries: A polyvinyl siloxane (PVS) impression was taken (Aquasil Ultra, Dentsply; Charlotte, NC) of teeth #6-#11. The temporary restorations were made from a putty matrix based on the wax-up. The teeth were spot-etched with a 32% phosphoric acid semi-gel etchant with benzalkonium chloride (Uni-Etch, Bisco; Schaumburg, IL) and bonded (Scotchbond Universal, 3M; St. Paul, MN) while light-cured luting cement (Choice 2, Bisco) was used to cement the temporary restorations. Since this element allowed for a trial run of the new smile design, a significant amount of time was spent ensuring

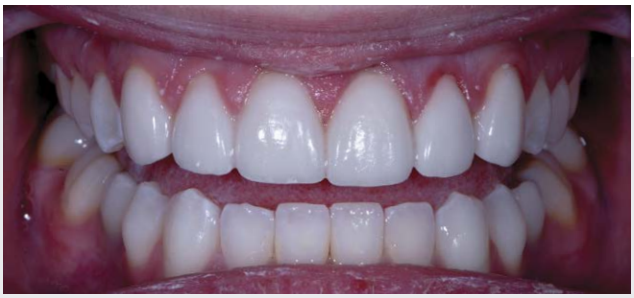

Figure 8: During the initial try-in of the veneers, the contour and anatomy were not ideal, and the case was sent back to the lab.

Figure 9: Postoperative smile view (1:2) showing excellent symmetry and color match.

Figure 10: Postoperative retracted view (1:2) showing nice anatomical form and even gingival contour.

the final polish and form of the provisional restorations. The last restorative procedure was to confirm that the temporary veneers were secure and not causing a functional issue by constricting the bite.[12] While sitting at a 45-degree angle, a blue 200-µ horseshoe-shaped articulating paper (Bausch; Nashua, NH) was used to analyze the bite. There were no blue streaks or excessive forces placed on the lingual edges of the maxillary incisors.

Bleaching and evaluation period: The patient continued to bleach (at-home bleaching with a 16% carbamide peroxide gel [Philips Zoom NiteWhite, Philips Zoom; Stamford, CT] had begun after the initial study models were taken) while still wearing the temporary restorations. A follow-up appointment was scheduled for three weeks later. The patient had stopped bleaching for a two-week period to take final shade photos for the ceramist. During the additional time with the temporary restorations, the patient came in for evaluation of her smile and to take photographs. This evaluation period and the additional photography provided vital pieces of communication. The ceramist was able to use the initial photos, the wax-up, and the photographs of the temporary restorations to fabricate the final restorations **(Figs 6 & 7)**.

Try-in appointments: At the initial try-in appointment, the temporary restorations were removed, and the porcelain veneers were tried in with try-in paste (Choice 2). Photographs were taken to evaluate the restorations. At this initial try-in, there were some minor issues with line angles, tooth anatomy, and tooth contours that had to be addressed.[13] It was decided that the restorations needed to look more lifelike and natural, and that they should harmonize better with the natural posterior teeth **(Fig 8)**.

At the second try-in, it was agreed that the restorations met the esthetic criteria for clinical excellence and patient satisfaction. The margins and contacts were verified, and the restorations were bonded (Clearfil Liner Bond2V Primer, Photo Bond Catalyst, Porcelain Bond Activator, Universal Bonding Agent, Kuraray America; New York, NY) into place **(Figs 9 & 10)**.

Tooth preparation for bonding: The teeth were prepared for bonding as follows:

- temporary veneers were removed
- teeth were microabraded (PrepStart unit, dry, Danville; San Ramon, CA) at 40 psi pressure with 27-µ aluminum oxide particles (Zest Dental Solutions; Carlsbad, CA)[14]
- tissues were retracted with gingival retraction paste (Expasyl, Acteon; Mount Laurel, NJ) and checked to ensure there was no gingival bleeding
- teeth were rinsed with water and air-dried
- plumber's tape was placed on the adjacent teeth to protect them from any etch/bond that was placed
- etchant was placed, rinsed, and air-applied to the teeth
- primer was placed (Liquid A and liquid bottles of Clearfil Liner Bond 2V) and air-dried
- bond was placed, air-dried, and light-cured (Clearfil Photo Bond, Activator and Catalyst mixed with Universal).

Restoration preparation for bonding: The steps taken to prepare the restorations for bonding were as follows:

- cleaning paste (Ivoclean, Ivoclar Vivadent) was used after the try-in
- four coats of silanate (RelyX Ceramic Primer, 3M) were added, with each coat being allowed to dry individually
- bonding agent (Clearfil Photo Bond Catalyst, Porcelain Bond Activator, Universal Bonding) was placed on the restoration
- light-cured luting cement (Choice 2, Milky Bright) was placed.

After cementation, the occlusion was verified. Bausch 200-µ horseshoe articulating paper was used to verify there was no constricted envelope of function.[12]

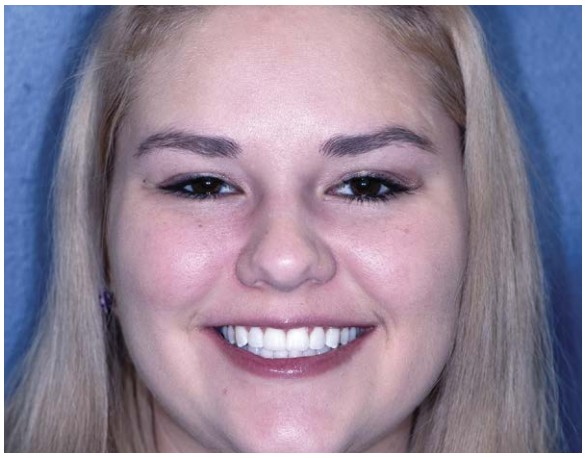

Figure 11: Postoperative portrait view.

Figure 12: Happy patient with her beautiful new smile.

Summary

A smile design case must be built upon sound treatment planning. Establishing the ideal esthetic position of the maxillary anterior teeth based on the patient's facial esthetics is the proper starting point. From there, the clinician can properly determine the position of the maxillary posterior teeth and the mandibular teeth based on smile design principles and function. Digital photography and a diagnostic wax-up allow the treatment plan to come to life **(Figs 11 & 12)**.

Acknowledgments

The author thanks Sandra Stassen, CDT (Pierson, MI), for her collaboration and ceramic artistry on this case. He also thanks Deb Martin, RDA, for her help with the clinical photographs in this article and assistance with his Accreditation cases. Thanks also go to Dave Burgess of Studio 616 Photography (Grand Rapids, MI) for his beautiful portrait photography.

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Disclosure: The author did not report any disclosures.