

SMILE DESIGN *with* DIRECT COMPOSITE VENEERS

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Abstract

Direct composite veneers allow clinicians to deliver an outstanding esthetic outcome with the benefit of minimal tooth modification. This ability to be conservative is desirable for patients and also reduces the risk of future case failure by maintaining tooth structure. In addition to pursuing esthetic enhancements, a smile design case is also an opportunity for enhancements in functional design. The successful completion of a smile design case with direct composite veneers is extremely rewarding and humbling for the clinician while it provides the patient with outstanding results that can rival those of porcelain restorations.

Key Words: direct composite veneer, smile design, envelope of function, Accreditation Case Type V

Introduction

Successfully completing a smile design case involves far more than esthetic placement of a restorative material. Many patients seeking esthetic enhancements unknowingly have pathologies and their resulting damage, which often are related to the patient's esthetic concern. It is essential to diagnose and treat the underlying cause or causes to decrease the risk of recurring damage. This patient's concerns were related to damage from orthodontic relapse and a constricted envelope of function that resulted in the failure of natural and repaired dentition. Treatment with direct composite veneers was a conservative option that achieved her esthetic goals while decreasing future functional risks.¹

Case Report

Patient History and Chief Complaint

A 25-year-old patient was unhappy with her teeth and smile. She did not like the overall shape of her teeth, which were asymmetric, uneven, worn, and crooked, and she felt that her smile looked "small." She also was unhappy with the color of her teeth, which she wanted to be lighter but, more importantly, more uniform, as they were of varying shades. The patient had orthodontics when she was young and noticed the tooth discoloration afterward. She stopped wearing her retainers, resulting in orthodontic re-

lapse and, following this unwanted movement, her teeth became worn and chipped. The composite restorations that were placed had since failed. She had researched composite veneers and specifically requested this cosmetic treatment (**Figs 1a & 1b**).

Clinical Findings and Diagnosis

A thorough diagnosis was imperative for proper treatment planning and patient education. A comprehensive examination was completed to ensure an accurate diagnosis and the best standard of care. Analysis of her facial esthetics revealed a level plane of occlusion, an ideal gingival show on full smile, and a proper maxillary midline. The patient's maxillary arch was narrow, resulting in slight negative space posteriorly due to lingually tipped teeth (**Figs 2a & 2b**).² The head and neck exam revealed no pathology and healthy and properly functioning temporomandibular joints. An intraoral exam showed healthy tissue and a complete dentition with Class I occlusion on the patient's left side and Class II tendency on the right.

Functionally, her occlusion was losing anterior excursive guidance due to diminished anterior tooth length. The lingual excursive plane angles were steep due to her lingually tipped teeth, and wear facets were present throughout the lingual excursive surfaces of all anterior teeth. There was no fremitus



Figure 1a: Preoperative full-face view (1:10).



Figure 1b: Postoperative full-face view (1:10).

present. A clinical hard tissue examination revealed both new and recurrent decay on many posterior teeth, and the wear facets and chipping present anteriorly had resulted in weakened enamel and exposed dentin. Composite restorations on teeth #8 and #9 were worn and failing. Tooth form was asymmetric due to anatomic variation and improper position secondary to orthodontic relapse. Dentin exposure from recession and mild cervical hypocalcifications resulted in color presentation indicative of pathology. She had a healthy periodontium and overall appropriate gingival contours except for broad papillae mesial to her lateral and central incisors, and an asymmetric height of contour at #8 and #9.

Treatment Plan

General treatment recommendations included direct composite restorations to treat the patient's caries along with a review of caries risks and prevention strategies. In addition, the following were recommended to the patient specific to her chief complaint:

1. Orthodontic treatment to improve occlusion, arch form, and gingival position prior to any tooth modification.³
2. If orthodontics was declined, comprehensive occlusal equilibration to maintain her current mandibular position and create less steep cuspal inclines of her lingually tipped teeth, thereby opening the envelope of function.^{4,5}
3. Teeth whitening.
4. Gingivectomy to provide better symmetry of the papillae between the maxillary incisors.

5. Gingivectomy or osseous surgery depending on the bone and gingival relationship, to improve gingival symmetry surrounding #8 and #9.
6. Direct composite or porcelain veneers on #4 through #13 to provide ideal tooth shape, position, and a more uniform color and appearance.
7. Fabrication of an occlusal guard to protect the patient's teeth and planned restorations from bruxism.

After further discussion, the patient decided on in-office whitening and disease-related treatment. She declined orthodontics and instead elected to pursue gingivectomy or osseous surgery, comprehensive occlusal equilibration, direct composite veneers on #4 to #13, and fabrication of an occlusal guard (Figs 3a-5b).

Treatment

Whitening: The patient wanted lighter teeth, so her first visit included in-office whitening (Opalescence Boost, Ultradent; South Jordan, UT). Her preoperative base shade was A2 (Classical Shade Guide, VITA North America; Yorba Linda, CA) and resulted in a final shade of BL4 (Bleach Shade Guide, Ivoclar Vivadent; Amherst, NY). After a two-week period to allow for color stabilization, her tooth shade was observed to be approximately Vita A1/B1. At that point, direct composite fillings were completed to treat the caries present on #3, #4, #12, and #13.

Tooth shape: The full series of required AACD Accreditation photographs was taken.⁶ A vinyl polysiloxane (VPS) impression (Paradigm, 3M; St. Paul, MN) was made along with a horizontal reference stick bite. Discussion with the patient revealed her de-



Figure 2a: Preoperative full-smile frontal view (1:2).



Figure 2b: Postoperative full-smile frontal view (1:2).

// COMPLETING A **SMILE DESIGN** CASE INVOLVES FAR MORE THAN ESTHETIC PLACEMENT OF A RESTORATIVE MATERIAL. //



Figure 3a: Preoperative frontal retracted view (1:2).



Figure 3b: Postoperative frontal retracted view (1:2).

sired tooth shape was similar to that of “Softened” (LMI Global; Las Vegas, NV), but with shorter laterals. She wanted her teeth to display moderate incisal translucency and a relatively uniform color. She chose shade B1, similar to the color of her teeth after whitening, for the base shade of her definitive restorations.

Wax-up and mock-up: Utilizing the above information, a diagnostic wax-up of #4 to #13 was completed in the office. This allowed for preparation of the anatomical demands transitioning from the patient’s current tooth form to the final restorations. The diagnostic wax-up was completed without any model preparation; this method highlighted areas requiring conservative tooth preparation to allow for a uniform and predictable final material thickness (**Fig 6**). The new anatomic form provided

more length, additional facial fullness, improved axial inclinations, and fuller buccal corridors.^{2,3}

A VPS putty stent (Correct Plus, Pentron; Orange, CA) was made from the diagnostic wax-up and used to place a mock-up (Luxatemp, DMG America; Ridgefield Park, NJ) on the teeth to verify the proposed tooth form. The patient was thrilled and approved the proposed design. She indicated that she was ready to pursue the proposed treatment plan immediately, so local anesthetic was then delivered.

Gingivectomy: Due to the asymmetry of #8 and #9’s gingival contours, bone sounding was performed and the results verified that adequate space for gingivectomy was present without invading the biologic width.^{7,8} Gingivectomy was accomplished with

a diode laser (Odyssey, Ivoclar Vivadent), being sure to leave 2.5 to 3 mm of tissue coronal to the crestal bone.^{7,8} The gingiva was contoured to provide ideal overall gingival symmetry, including the zeniths of #8 and #9 and papillary proportions (Fig 7).

Preparation: The mock-up was used as a reduction guide for ideal and minimally invasive preparation. Reduction was completed to provide restorative material space of 0.4 mm cervically, with additional depth incisally due to the lingually tipped teeth. This reduction was chosen for composite veneer placement with minimal shade change while encouraging natural cervical warmth to influence the final veneers' appearance.^{9,10} All old restorative material, areas of stain or decay, and damaged or poorly supported enamel were removed. Preparation was designed to be as conservative as possible while ensuring the best long-term esthetics, function, and health. The teeth were then sandblasted with 60- μ aluminum oxide (Dentsply Neytech; York, PA) at 80 to 100 psi for three to five seconds per tooth (Fig 7). Isolation was maintained through the rest of the procedure with a lip and cheek retractor (OptraGate, Ivoclar Vivadent) and cotton rolls.

Etching, bonding, and layering: Enamel surfaces were etched with a 35% phosphoric acid gel etchant (Ultra-Etch, Ultradent), rinsed thoroughly, and lightly dried. A universal bonding agent (Prime and Bond Elect, Dentsply Sirona; Charlotte, NC) was ap-

plied and cured with an ultraviolet curing light (VALO Grand: Ultradent) according to the manufacturer's specifications. Using the incisal matrix made from the diagnostic wax-up, the lingual and incisal shell were created with a nanohybrid composite (Mosaic, shade EW, Ultradent). This composite was chosen for its ideal characteristics of strength and opacity to replace missing tooth structure in this area of function, and to provide a faint incisal halo.^{9,10} Next, a microfilled composite (Renamel, shade B1, Cosmedent; Chicago, IL) was placed over the cervical, body, and into the incisal of the tooth to create the mamelons and internal anatomy (Fig 8). The final layer (Renamel Microfill, shade Incisal Light) was applied from the mid body to the incisal of the tooth. This microfilled composite was selected as the veneer layer due to its translucency, high polishability, and gloss retention.^{9,10} The left central incisor (#9) was completed first to allow verification of ideal proportion and midline position. Teeth #7, #8, and #10 were then completed following the same layering technique. The composite veneers were roughly contoured and occlusion was checked, after which the patient was dismissed for the day.

Imparting chroma: At two subsequent appointments, the maxillary right and then the maxillary left canine and premolar direct composite veneers were placed with one modification to



Figure 4a: Preoperative right lateral retracted view (1:2).



Figure 4b: Postoperative right lateral retracted view (1:2).



Figure 5a: Preoperative left lateral retracted view (1:2).



Figure 5b: Postoperative left lateral retracted view (1:2).



Figure 6: Diagnostic wax-up.



Figure 7: Intraoperative retracted view (1:2), initial preparation and abrasion.



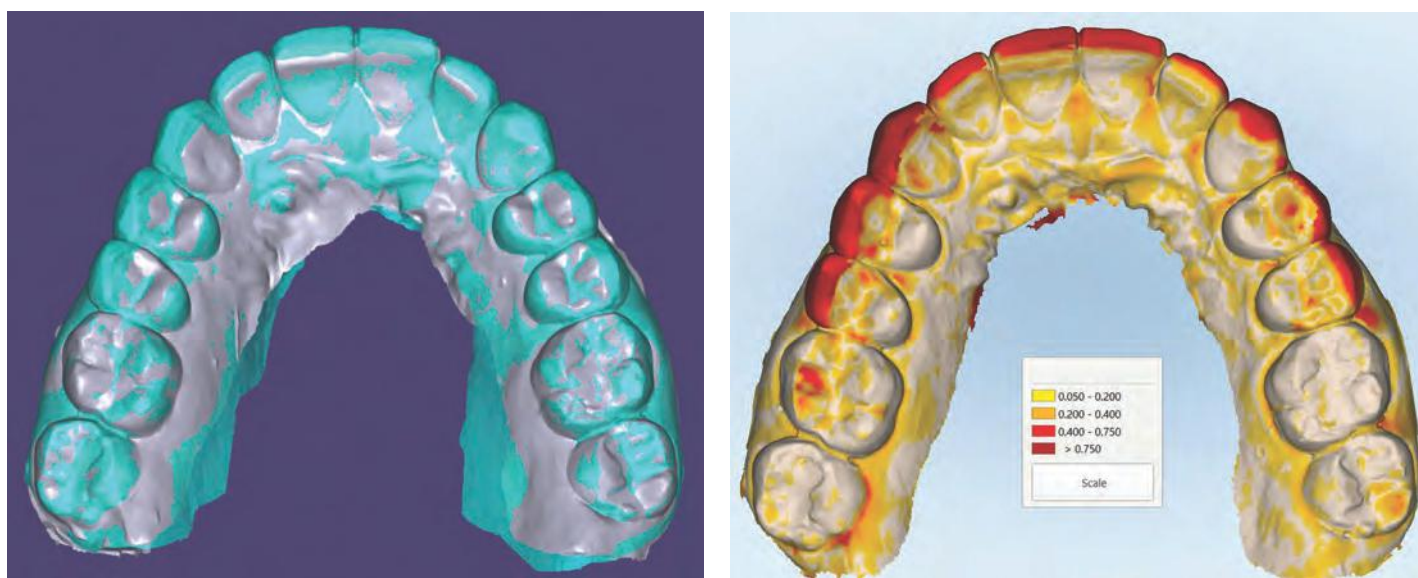
Figure 8: Intraoperative retracted view (1:2), initial layer of restorative resin after curing but before contouring.



Figure 9: Intraoperative retracted view (1:2) after contouring but before polishing.

// PREPARATION WAS DESIGNED TO BE AS CONSERVATIVE AS POSSIBLE WHILE **ENSURING THE BEST LONG-TERM ESTHETICS, FUNCTION, AND HEALTH.**





Figures 10 & 11: Preoperative and postoperative digital models overlaid to visualize the material addition and conservative enameloplasty.

the technique described above. Mosaic Shade A1 was incorporated at the mid body and mamelons of the canines to provide slightly more chroma, as these teeth naturally exhibit slightly more chromatic intensity.^{3,11} This direct composite veneer layering technique was chosen for its simplicity while using the color of the tooth substrate to provide natural warmth at the cervical of the restoration.¹²

Enameloplasty: With the completion of the roughly placed direct composite veneers (Fig 9), occlusion and mandibular position were verified to be unchanged. To accommodate for the patient's new longer and more buccally positioned incisal edges and cusp tips, very conservative enameloplasty was completed on the lingual excursive inclines to create shallower guidance and further open the envelope of function (Figs 10 & 11).^{4,5} All occlusal contacts were again verified to ensure that changing the excursive plane angles did not introduce unwanted posterior excursive contacts. The patient reported significantly greater freedom in function and comfort of her bite than she had ever felt before.

Contouring and shaping: The patient returned for several appointments over the following six weeks to continue with contouring and shaping for overall anatomy and smile design. Contouring was completed with #12B blades (Miltex, Integra; Mansfield, MA), fine diamond burs (Piranha #859010F, #859014F, SS White; Lakewood, NJ), fluted finishing burs (KaVo 7901, Kerr; Brea, CA), contoured interproximal strips (Qwik-Strips; Birmingham, MI) and interproximal finishing strips and discs (Sof-Lex, 3M). Using these instruments, initial length and

proportion were refined and then verified with sliding calipers. Facial contours, axial inclinations, and emergence of the restorations were then refined and verified with pencil tracing of the line angles.¹³⁻¹⁵ Finally, embrasures were refined to create the ideal interproximal contact sizes and locations. When final shaping and contouring was completed, surface anatomy, surface texture, and polish were imparted^{15,16} with rubber polishing points (FlexiPoints, Cosmedent; Chicago, IL), "squid" composite polishing points (Meisinger; Centennial, CO), and fine Sof-Lex discs. Finally, a felt polishing buff with polishing paste (FlexiBuff and Enamelize, Cosmedent) was used to impart the final polish (Figs 12a & 12b).

Evaluations, modifications, and final restorations: After every appointment, the full series of AACD photographs was documented and impressions were made for study models.¹⁷ Using this information, a thorough evaluation was completed of the treatment delivered that day, which allowed for modifications to be planned for each subsequent visit. This continuous and thorough assessment ensured that the treatment would ultimately result in the desired final outcome.

The final restorations exceeded the patient's expectations (Fig 13). Impressions and bite relations were then made for fabrication of an occlusal guard. The patient returned after two weeks for reevaluation of her new restorations and occlusion. Postoperative photographs were taken, and her occlusal guard was delivered. No further occlusal adjustment was needed, and the new restorations and tissues exhibited excellent health.



Figure 12a: Preoperative retracted left lateral maxillary anterior view (1:1).



Figure 12b: Postoperative retracted left lateral maxillary anterior view (1:1).



Figure 13: Postoperative full-face view (1:10).

Summary

The impact of a smile is incredible. A smile can provide a glimpse into a patient's emotions, health, and age. There is a great desire to portray the best of these attributes, even as patients increasingly insist on minimally invasive treatments. Patients often present with expectations of the dental care they are seeking, and it is important to listen to them, help to educate them, and ultimately provide them with excellent care.

Direct composite smile design is an excellent treatment option that is not often undertaken due to complexity and time constraints. It is an exercise in planning and execution that requires the clinician to be both dentist and lab technician. However, with sufficient preparation, this comprehensive treatment can be provided in a sequenced and predictable way that allows the doctor and patient to achieve very rewarding outcomes with very conservative techniques.

THE PATIENT REPORTED SIGNIFICANTLY GREATER FREEDOM IN FUNCTION AND COMFORT OF HER BITE THAN SHE HAD EVER FELT BEFORE.

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