Abstract

Members pursuing Accreditation from the American Academy of Cosmetic Dentistry value the concept of “responsible esthetics,” and persistently work to achieve optimal esthetic results while aiming to implement minimal to non-invasive treatment modalities. Accreditation Case Type V, Six or More Direct Composite Resin Veneers, is a classic example of a contemporary treatment option that embodies this philosophy. Case Type V integrates the basics of conservative esthetic treatment with the core of smile design principles, and the micro and macro components of dentofacial esthetics. Purposeful planning and careful management of the restorative material is key to a successful result. This article presents a simplified, controlled, and systematic approach to treating this case type to help ensure consistent, predictable, and favorable outcomes.

Key Words: bonding, composite resin veneers, prepless veneers, Accreditation Case Type V
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Introduction
As the science of dental bonding materials has advanced over the past few decades, direct resin veneers have become one of the most conservative and natural-looking restorative options clinicians can offer their patients. Because we have the ability to stack and layer resin and artistically employ tints and opaquers chairside in the same way a laboratory technician would with ceramic, we have the potential ability to create restorations that may even, in some cases, rival the look of the ceramic veneer.

The direct resin veneer case gives the restorative dentist the opportunity to artistically demonstrate an understanding of how the principles of smile design, functional occlusion, biocompatibility, and both the micro and macro components of dentofacial esthetics can harmonize to produce an often life-changing result for our patients.

Patient’s Chief Complaint
A 24-year-old female presented with no significant medical history and a chief complaint of “chipped and worn-looking front teeth.” She also expressed concern over some “darkening areas” or “spots” on her front teeth, especially along the gum line (Fig 1). She wished to discuss her options for improving the overall look of her front teeth. The patient was otherwise in excellent health.

Diagnosis and Treatment Plan
A comprehensive examination was conducted. The patient presented with a complete dentition, save for unerupted wisdom teeth. Periodontally, the tissue demonstrated general signs of mild gingivitis. The patient reported that it had been about a year since her last dental checkup and prophylaxis, but said that she flossed most days. Radiographically and clinically, it was observed that the dentition had been minimally restored. There was no evidence of active caries.

Interdigitation of the teeth revealed a Class I molar relationship with mild incisal and occlusal wear. Upon further evaluation, the patient’s temporomandibular joint was free of symptoms and hinged easily with light bimanual manipulation. A centric relation (CR) bite record and model analysis indicated various occlusal interferences from CR to maximum intercuspation (MI) in the premolar and molar area. Centric holding contacts were not present on all teeth from CR to the initial tooth contact upon closing. The slide from CR into MI was slight and appeared correctable with an occlusal equilibration.

Esthetic evaluation of the preoperative smile revealed the following findings:
- tooth position at repose and at full smile was in an acceptable range
- teeth #7-10 were chipped along the incisal edge
- the facial surfaces of the upper anterior eight teeth demonstrated signs of erosion and thinning due to a reported repeated exposure to citric acid over time, exposing the dentin on #8 and #9
- incisal embrasures could be restored to an acceptable degree
- tooth proportion and central dominance also could be restored acceptably
- gingival zeniths of the six anterior teeth demonstrated a slight “gull wing” over the lateral incisors and were harmoniously in balance
- the reveal of the posterior teeth adequately filled in the buccal corridor
- tooth shade was measured at a B1 to A2 range.

After a discussion with the patient about treatment with ceramic veneers versus direct bonding, direct resin veneers were selected due to the conservative nature of the procedure. With careful management of the occlusion and the restorative materials, a lasting and highly esthetic result can be achieved predictably.

The treatment plan was as follows:
- periodontal tissue management
- model analysis and diagnostic wax-up for restoring #5-12
- occlusal equilibration
- direct bonded resin veneers, #5-12.
Treatment

Periodontal Management
Periodontal tissue management was immediately implemented and consisted of a thorough dental prophylaxis complete with oral hygiene instruction to enhance the patient’s regular home care. The proper technique for flossing was reviewed and practiced with the patient. The benefits of an electric toothbrush and a tongue scraper were discussed and the patient was educated on their use.

Next, impressions and a bite record were taken for study models of the patient’s dentition and occlusal relation. Photographs were taken and a color map was created for the new restorations. In addition, a Kois facial analyzer transfer (Panadent; Colton, CA) was made as a T-reference record. The author created a diagnostic wax-up from the models as part of the planning and workup for the restorations of the teeth. A putty index cut along the incisal edge was made from the wax-up as a guide for the direct placement and bonding of the resin material.

At a subsequent appointment an equilibration was performed, resulting in the elimination of the CR-to-MI slide and the creation of stable occlusal holding contacts on all posterior teeth. Excursive movements were then evaluated and interferences posterior to the cusps were removed. All areas adjusted were repolished with fine diamonds.

Wax-Up
Prior to the preparation of the teeth, a diagnostic wax-up had been done to create a guide for the functional and esthetic components of the restoration. Clinicians can gain valuable insight with respect to the needs of their individual cases when they perform their own diagnostic wax design. The wax-up confirmed that in this case, due to the loss of length and enamel thickness on the upper front teeth, there would be no need for any tooth preparation other than micro-etching of the enamel prior to bonding. Opaquers and tints often can be useful when a color or value change needs to occur in an area where there is little restorative space to “build in” that change. The diagnostic wax-up showed that the use of tints and opaquers was unnecessary for this case because adequate restorative room was available to build in the characteristics desired with composite resin.

Preparation
Tooth preparation and restoration to full contour was done one tooth at a time to simplify the control and management of the material. A small round bur was used to remove any soft exposed dentin from the facials of #8 and #9. Tooth #8 was then isolated with a thin metal matrix band and the facial, incisal, and lingual aspects of the incisor were micro-etched (MicroEtcher II, Danville Materials; San Ramon, CA) with aluminum oxide and rinsed (Fig 2). Micro-etching effectively cleans the tooth surface, additionally removing any biologic film, plaque, debris, or even potential oil from a handpiece that may otherwise interfere with resin bonding. Micro-etching also creates a micro texture on the tooth surface that increases bond strength to enamel.

The adjacent teeth were isolated with white polytetrafluoroethylene tape. An isolation device (Isolite Systems; Santa Barbara, CA) was placed to control moisture and humidity during the steps of adhesive bonding. Subsequently, the enamel surface was treated with 35% phosphoric acid for 15 to 30 seconds and rinsed well. The excess moisture was removed with a cotton pellet. The bonding agent was then applied in three coats. The solvent was removed by air-thinning and vacuum, leaving the tooth surface shiny. The bonding agent was light-cured on both the facial and lingual surfaces.

Figure 2: Tooth #8, micro-etched surface prior to bonding.
Layering and Contouring

The first layer of composite was placed using the putty matrix fabricated from the wax-up. A thin lingual shell was sculpted into the matrix with a B1 dentin shade hybrid composite (Four Seasons, Ivoclar Vivadent; Amherst, NY). The opacity of this composite works well to mask out the dark background when building up the length of a tooth. This layer was pressed in place with the matrix. An additional small amount of the same composite was smoothed onto the incisal-facial of the tooth and cured (Fig 3). The matrix was then removed and the composite was cured from the lingual aspect as well (Fig 4). This provided the lingual and incisal form for the restoration and served as a “canvas” onto which the subsequent varying layers of composite were later applied and cured.

The facial surface was pre-wet with a small amount of flowable composite and brushed thin across the tooth with an artist’s brush. This helps the packable composite stick more seamlessly to the prepared surface and prevent “pull-away” when sculpting with instruments (the flowable was cured at the same time as the overlying packable composite). A full contour layer of B1 enamel (Filtek Supreme, 3M ESPE; St. Paul, MN) was then placed over the facial. This enamel composite was first rolled into a ball with clean-gloved fingers to remove any air inclusions or imperfections and then was placed with a composite instrument. The composite was tapped into place with a flat composite instrument over the facial and then pulled through the proximal contacts with a clear mylar strip (Fig 5). The tooth was contoured with a tapered fine diamond bur and sanding discs to develop the primary anatomy. Careful attention was paid to ensure that the midline being created was not canted but would bisect the central papilla symmetrically and be parallel to the long axis of the face (Fig 6). Such a cant can easily and unintentionally occur when the clinician routinely sits behind the patient at a 10 or 11 o’clock position. Regularly moving in front of and facing the patient can help the operator to assess this more accurately.

Once #8 was contoured, the mesial was polished with fine sanding strips to prevent bonding with the buildup of #9. Tooth #9 was prepared with a microetcher (Fig 7), and
Figure 6: Primary anatomy refined with a thin, pointed, fine diamond bur and medium finishing disc on slow speed. Careful attention was paid to ensure that the midline was correct.

Figure 7: Tooth #9, micro-etched surface prior to bonding.

Figure 8: Initial layer of composite cured for #9, dentin shade B1. Putty matrix used as a guide for placement.

Figure 9: Second layer of composite cured, enamel shade B1. A mylar strip was used to “pull” the composite through the interproximal areas and shape the facial embrasures.

an etch-and-bonding protocol was accomplished as was completed on #8. The putty matrix was again inserted with the B1 dentin composite and the lingual buildup was cured into place on #9 in the same fashion as previously done on #8 (Fig 8). The enamel shade was separately added, sculpted, and cured to full contour (Fig 9). Note that if too much composite is placed into the putty matrix, the clinician may have difficulty seating the putty completely flush with the lingual of the tooth to be restored. This can lead to the creation of a longer tooth than planned. Even with a putty matrix as a guide for composite placement, it is important that the clinician verify the lengths and proportions with the patient’s face and with the predetermined goals of treatment during the buildup phase. Tooth #9 was subsequently shaped in the same fashion until basic symmetry was established between #8 and #9.

It is critical that the central incisors appear to be mirror images of each other. Use of a mechanical pencil to highlight the line angles and reflective powder aided in evaluating symmetry chairside. These simple tools allow the clinician to see anatomy, line angles, and irregularities much more easily (almost like an instant stone model) when comparing contralateral teeth (Figs 10-12).

Teeth #7 and #10, then #6 and #11, and then #5 and #12 were done using the putty index and the same preparation and layering method. A natural color transition was created from central to cuspid by using a dentin and enamel shade with slightly more chroma as we moved distally (A1 enamel for the lateral incisors and first bicusps, and A2 for the cuspids) (Figs 13-15).

The detailing of the contours was then done as a group. Photographs were taken along with molds of the upper arch for study prior to the patient’s next appointment. At that time improvements were made to the contours of the teeth based upon changes assessed from study of the model and photographs.
Figures 10 & 11: Reflective powder was used to aid in the evaluation of “mirror-image” symmetry between #8 and #9.

Figure 12: Basic anatomy and symmetry achieved for both #8 and #9.

Figure 13: Basic anatomy and symmetry achieved for ##5-12.

Figure 14: Retracted right lateral view of basic anatomy. Note the color transition from B1 to A1 to A2 to A1 from central to bicuspid, respectively.

Figure 15: Retracted left lateral view of basic anatomy and color transition.
Cutback

Once the primary contours had been established, a cutback technique similar to what a laboratory technician does with ceramic was initiated. The incisal third of the incisors was cut back, leaving a very thin frame or "halo" along the proximal and incisal edge (Fig 16). The prepared area was newly micro-etched and rinsed and dried. Bonding agent was also reapplied and air-thinned to remove any solvent. A B1 dentin to create the appearance of lobes in the translucent zone was placed. Filtek Supreme A5 and white effects enamel (3M ESPE) were added for character and cured (Fig 17). Estelite Omega Trans (Tokuyama Dental America; Encinitas, CA) was placed into the incisal area to create the opalescence at the incisal third (Fig 18). Finally, an enamel layer was placed to bring each tooth back to full contour (Fig 19).

The internal incisal characteristics and additional layering were completed at this stage of the buildup, instead of during the initial layers prior to achieving the final contour. This was done to make the layering and depth of final translucency and character more uniform. When the clinician does not have a facial surface as a reference from which to work backward into the tooth, the final depth of the internal character may vary from tooth to tooth once the final contouring has been accomplished (Fig 20).

Enamelplasty

Once the forms of the maxillary incisal edges were completed, the patient was again taken through functional mandibular movements in protrusive, edge-to-edge, and lateral excursions to confirm smooth transitions and evenly shared forces during function to help protect the restorations. To achieve this, very slight enamelplasty was performed on the mandibular incisors with a fine diamond and polished with a gray Dialite polishing wheel (Brasseler USA; Savannah, GA). It was noted that a similar direct resin restoration of the facial-incisal of #24 would be esthetically desirable in the future.

After a discussion with the patient about treatment with ceramic veneers versus direct bonding, direct resin veneers were selected due to the conservative nature of the procedure.
Finishing
Finishing was accomplished with four instruments in the following sequence: a long tapered fine diamond bur, a medium Sof-Lex disc (3M ESPE), a “brownie” polishing point (Shofu Dental; San Marcos, CA), and a bristle brush (Jiffy Ultradent; South Jordan, UT) (Fig 21). An electric handpiece set to the slowest setting for each of these four steps allows the clinician to more easily visualize the careful and thorough removal of fine scratches when proceeding from one step to the next.14

Utilizing a curing light, the restorations were then recured to obtain the highest polymerization at the surface and a final polish was done with composite polishing paste (Enamelize, Cosmedent; Chicago, IL). Photographs were taken for further evaluation and the patient was scheduled to return for a final follow-up (Fig 22).

Summary
The effect that a restored and enhanced smile (Figs 23-25) can have on a patient who may once have felt embarrassed about their teeth is not easily described. Providing that type of service is really the root of what makes us passionate about the pursuit of excellence in esthetic dentistry. Minimally invasive or even non-invasive procedures such as direct resin veneers, which can enable us to achieve high levels of esthetics responsibly, truly make us all smile a little more broadly.

Figure 19: Enamel composite added to the facial to reestablish the full contour.

Figure 20: Preliminary polish showing incisal “halo” and internal incisal effects.

Figure 21: Simplified sequence of polishers from left to right, all used on an electric handpiece at the lowest setting.

Figure 22: 1:2 retracted view after final polish, composite veneers ##5-12.
Careful attention was paid to ensure that the midline being created was not canted but would bisect the central papilla symmetrically and be parallel to the long axis of the face.

References


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