Many esthetic procedures can also improve the structural integrity of the teeth as well as the health of periodontal tissues.

Minimal Intervention—Maximum Esthetics

Emulating Nature with Composite Resin

Mohan Bhuvaneswaran, MDS, AAACD

Abstract
This article discusses the use of direct resin veneers in a smile rehabilitation case for a patient with discolored upper anteriors. This treatment modality gives the clinician artistic control while facilitating esthetic outcomes with minimal tooth preparation. Improving the structural integrity of the teeth was key in this case. The importance of utilizing the conservative concepts of minimally invasive dentistry, having sound knowledge of scientific and technological advances in procedures and materials, and a meticulous contouring procedure are addressed.

Key Words: hypocalcification, composite resin, silicone putty index, Class IV defect, midline cant
Introduction
Thanks to today’s increasingly appearance-conscious patients, esthetic procedures have become a part of our daily practice. Many esthetic procedures can also improve the structural integrity of the teeth as well as the health of periodontal tissues. Minimally invasive dentistry to maintain and protect natural tooth structure and thereby increase the overall oral health of the patient\textsuperscript{1-3} has become increasingly popular. It is essential that clinicians possess a sound knowledge of scientific and technological advances in procedures and materials in order to exceed patients’ expectations.

Direct composite veneering is one such procedure. Although enhancing a smile using composite material can be challenging, direct resin veneers can give the dentist full artistic control over the esthetic outcome of the case, resulting in a smile that rivals those created by nature.\textsuperscript{4,5} They also can be extremely conservative, requiring minimal tooth preparation. This process allows the dentist to utilize and showcase his or her skills in creating a smile directly chairside.
Patient Complaint and History
A 22-year-old female patient was unhappy with her discolored upper anterior teeth (Fig 1); her greatest wish was to have a beautiful smile. The patient’s oral hygiene was extremely good, the soft tissues were in excellent condition, and her medical history was unremarkable. Radiographic and oral examinations were within normal limits. There was no temporomandibular joint pain, clicking, or any other abnormalities. A history revealed that she had fractured teeth #8 and #9 six years previously. They had been restored at the time with composite resin but she was unhappy with the esthetics. The patient had no other complaints.

Evaluation, Diagnosis, and Treatment Plan
The patient was from the southern part of India, where many inhabitants exhibit dental fluorosis. Mild fluorosis, as hers was, can be conservatively managed with direct resin veneers. A thorough clinical examination revealed the presence of white hypocalcific bands in the cervical third of all her teeth and randomly distributed mild hypocalcification in her upper and lower anteriors (Figs 2 & 3). The defects in the lower anteriors were relatively minor. Teeth #4, #5, #12, and #13 had composite restorations and were in reasonably good condition, requiring no alterations. The mesioincisal composite restorations at #8 and #9 were discolored and had no contour. The interdental excess of composite between #8 and #9 was impinging on the papilla, causing mild inflammation (Fig 4). Otherwise, the gingival architecture was excellent and required no further intervention. Study models and photographs showed that the proportions were perfect and provided a foundation for a successful smile rehabilitation. A few minor adjustments were needed to correct the mild midline cant and slightly lingually placed #7.

Although restoration with indirect veneers was an option, it would necessitate removing a great deal of tooth structure and not fulfill the goals of conservative treatment. Porcelain laminate veneers cannot be placed ideally without removing some tooth structure to ensure there is sufficient material thickness to enhance the restorations’ longevity and esthetic success.

Keeping in mind the above factors, as well as the patient’s age and the minimal tooth preparation that would provide sound enamel for bonding, direct resin veneers were proposed as the treatment of choice.

The treatment plan was as follows:
• remove discolored restorations at #8 and #9
• create intraoral mock-up
• fabricate palatal silicone putty index
• place direct composite veneers, ##6-11.
Discussion: Composite Resin

It is important that the dentist understand completely the properties of the prospective restorative material to determine its suitability for a particular case and that the desired final outcome be kept in mind. Ever since the introduction of Bis-GMA by Bowen in 1962, composite resin has undergone many technical advances. In the past, microfill was the choice for all anterior esthetic work because it demonstrates high polish and reasonable wear properties. However, its strength was a major drawback. This resulted in the development of nanohybrid composites, the current generation of which have excellent polishability, wear resistance, and strength. These high-quality materials in combination with good clinical skills can deliver predictable and long-term results in the most conservative way possible.

Treatment

Diagnostic Intraoral Mock-Up

A simple intraoral hybrid composite mock-up was planned because preparation would be minimal. Once the incisal edge positions were checked and the contours were adjusted, a palatal index was fabricated intraorally out of polyvinyl siloxane. The mock-up not only helped with this, but also in creating a shade map. Before the restorative phase began, the occlusion was analyzed to ensure that there were no discrepancies between centric relation and maximum intercuspation. Protrusive movements revealed adequate disocclusion of posterior teeth facilitated by anterior guidance.

Preparation and Layering

The first part of treatment included repairing #8 and #9 because this required correction of the Class IV defect and also the midline cant. Midline cant is best corrected at the beginning of treatment so that the cant does not become incorporated into all the teeth. The composite was removed from #8 and #9, a long bevel was made on the labial surface, and the remaining area was roughened with a medium chamfer diamond bur (Brasseler USA; Savannah, GA). The preparation extended sufficiently interproximally to conceal the tooth-restoration interface. The incisal preparation was very minimal so the surface discoloration disappeared at this point (Fig 5). A short bevel was made at the palatal aspect.

The teeth were managed individually and built up to full contour before they were contoured and polished as a group. As previously mentioned, #8 and #9 were treated first. A retractor (Optragate, Ivoclar Vivadent; Amherst, NY) and “tongue-away” (Dispodent; Chennai, Tamil Nadu, India) were used. Teeth were individually isolated with polytetrafluoroethylene tape and a size #00 retraction cord (Ultradent Products; South Jordan, UT) was placed in the gingival sulcus of #8 and #9. First #8 was etched with 37% phosphoric acid (Total Etch, Ivoclar Vivadent) for 15 seconds and thoroughly rinsed. Excess moisture was removed, with care being taken not to desiccate the tooth. Two coats of bonding resin (Tetric N-Bond, Ivoclar Vivadent) were applied on the tooth structure. After 20 seconds, adhesive layer was thinned out and then light-cured for 10 seconds.

The shade map that had been created earlier served as a blueprint during treatment and facilitated shade matching. The first layer of composite was used to create a palatal shelf. The silicone putty material was lubricated using composite wetting resin (Ultradent) prior to composite application. Composite (IPS Empress Direct Trans 30, Ivoclar Vivadent) was used to create the lingual shelf. The index was removed once light-curing was done. This shelf served as a scaffold on which further shades and opacities were built. The next layer, B1 enamel, was used in the proximal area to define the proximal walls. The proximal material was sculpted with a thin blade (TNPFIA6, Hu-Friedy; Chicago, IL). The Class IV defect was then restored with B-1 dentin to the level of the remaining tooth structure (Fig 7). The resin was compacted using spear-shaped blades (TNCCIB, Hu-Friedy). The cervical area was built up with A1 enamel, after which the middle and incisal thirds were built up with B1 enamel. The restoration was contoured (OptraSculpt pad, Ivoclar Vivadent). A #3 artist brush (Cosmedent; Chicago, IL) was used to adapt the composite layer without any voids. Once contouring was completed, the resin was light-polymerized for 40 seconds (Bluephase G2, Ivoclar Vivadent) (Fig 8). To minimize formation of an oxygen-inhibited layer, glycerin gel (Oxyguard, Ivoclar Vivadent) was used before the final cure.
Figure 6: Shade map.

Figure 7: Initial build of resin.

Figure 8: Polychromatic appearance after completion of buildup of #8.
The same process was carried out for #9. Once this was done, photographs were taken and models made to ensure that the midline cant had been eliminated. It is important to note that use of a cheek retractor makes the cant easier to identify in a photograph (Fig 9). After analysis it was found that minor recon钛uring was necessary. The same procedure was followed at the second appointment and the midline cant was eliminated. During the next two appointments the above-described incremental layering technique was followed for #7 and #10, and #6 and #11, in that order. The shade mapping for the laterals was cervical A2 enamel and the remaining A1 enamel; for the canines it was A3 enamel in the cervical and A2 enamel for the remaining the tooth structure. Prepara钛ion for the laterals and canines was very minimal—the hypocalcific spots were removed and other areas were just roughened. All preparations were in enamel only.

Contouring and Polishing
Excess material was removed from the surface as well as the margin with a #12 Bard-Parker surgical blade (Becton Dickinson; Franklin Lakes, NJ). The occlusion was checked and adjusted with a football-shaped diamond (Mani; Utsunomiya, Tochigi, Japan). Detailing contours of multiple anterior direct restorations can be a daunting task, the most common challenges including contour, polish, and tissue response. To achieve the detailing that is required for this type of case it is better that it be managed over the course of several appointments, as was done here. At the end of each visit, a diagnostic impression was taken to create models and photographs that could be evaluated prior to the patient’s next appointment. This aided greatly in visualization and in designing naturally balanced contours.

The primary anatomy form and contours were achieved with a series of carbide finishing burs (S.S. White; Lakewood, NJ). To maintain and refine the primary anatomy a lead pencil was used to mark the line angles and the central prominence on the labial surface of all the veneer surfaces. The three facial planes of contour were carefully developed and the entire surface was smoothed with a composite abrasive point (Kerr; Orange, CA).

Although enhancing a smile using composite material can be challenging, direct resin veneers can give the dentist full artistic control over the esthetic outcome of the case, resulting in a smile that rivals those created by nature.
The secondary anatomy developmental lobes (Fig 10) were created using a fine-grit diamond (Mani). Interdental contouring was accomplished with a series of diamond finishing strips (Edenta AG; Au, St. Gallen, Switzerland), ensuring that there was no proximal flash. Once finishing was complete, the tertiary anatomy was crafted with a medium-grit diamond (Edenta) (Figs 11a-11c). The restorations were polished with a series of fine diamond abrasives (OptraPol, Ivoclar Vivadent) and the interproximal areas were polished with Cosmedent strips. Final gloss was achieved using an aluminum oxide-based composite polishing paste (Enamelize, Cosmedent) and the entire surface was buffed (Flexi-Buff, Cosmedent). The entire contouring, finishing, and polishing process took another three appointments.

Postoperative and oral hygiene instructions were given and the patient was scheduled for a follow-up appointment and final photographs two weeks later (Figs 12-13c). She was extremely happy with the treatment outcome (Figs 14 & 15) and her confident smile clearly expressed that we had exceeded her expectations.

"Mild fluorosis...can be conservatively managed with direct resin veneers."

Figure 10: Schematic representation of primary and secondary anatomy.
Figures 11a-11c: Images taken for final evaluation of the restorations before polishing.

Figure 12: Postoperative retracted view; note the harmonious restoration.
Figures 13a-13c: Postoperative frontal, right, and left close-up views; the restorations almost emulate nature.

Figure 14: Postoperative full-smile view; the restoration blends in seamlessly with the natural dentition.

Figure 15: Postoperative full-face image; the patient’s happiness with her new smile is reflected in her eyes.
Summary
The impact of a smile enhancement on an individual can easily be seen in the confidence he or she develops after the treatment, especially as evidenced in a broader, more self-assured smile. Composite material can replace lost tooth structure very conservatively and with an excellent esthetic outcome. With proper treatment planning, careful execution, and keeping the final outcome in mind, smile rehabilitation with direct composite resin veneers can be minimally invasive and long lasting, and can rival the esthetics of ceramic restorations.

Acknowledgment
The author expresses gratitude to his mentor, Rebecca Pitts, DMD, FAACD, for her continuous support and encouragement regarding the case discussed in this article.

References

“Midline cant is best corrected at the beginning of treatment so that the cant does not become incorporated into all the teeth.”

Dr. Bhuvaneswaran is the director of Vignesh Dental Hospital, Chennai, Tamil Nadu, India, and the chief academic officer for Pearl Dental Academy, in Tamil Nadu. He also has a practice limited to restorative and cosmetic dentistry.

Disclosure: The author is a key opinion leader for Ivoclar Vivadent. He also receives honoraria from Ivoclar Vivadent for lecturing and conducting hands-on courses.