



# Chairside

## Closing Anterior Interdental Spaces and Enhancing Tooth Form Using a Small-particle Hybrid Composite

**T**he median diastema has been cited as a major esthetic concern for patients, and it manifests as a result of developmental, pathological, or iatrogenic factors.<sup>1</sup> A variety of treatment techniques are available to correct such conditions, and these include, but are not limited to, orthodontics, indirect restorations (eg, crowns, veneers, bridges), and directly placed composite restorations.<sup>1-3</sup>

Indirect techniques may be unacceptable to some patients because of the multiple visits they require, financial expense,<sup>2</sup> and potential destruction of otherwise healthy tooth structure. However, there are clinical situations in which such restorations are the most appropriate modality for closing diastemata.

Direct techniques, on the other hand, can be economical and successful in closing interdental spaces.<sup>2,3</sup> In fact, the conservative nature of these procedures is such that, in certain cases, the mesiodistal/coronal dimension of anterior teeth can be augmented without the need for mechanical preparation of the enamel.<sup>3</sup>

Such an approach is consistent with the philosophical tenants of minimally invasive restorative treatment, which implements need-

damage-, and risk-balanced dental procedures and reconciles them with anticipated and desired treatment outcomes.<sup>4</sup> Regardless of whether the clinician is addressing traumatic damage, maintenance, and correction of existing restorations, or correcting the color and form of teeth, the minimal intervention approach requires greater diagnostic efforts and more highly differentiated use of invasive procedures.<sup>4</sup> Still further, the newest concept of "prevention to eliminate extension" advocates preventing the placement of the initial restoration, as well as preserving and conserving tooth structure during the preparation of the restoration.<sup>5</sup>

To this end, the advent of improved composite resin materials and adhesive techniques has made it possible for clinicians to more predictably implement a conservative and practical approach to the closure of interdental spacing.<sup>6</sup> Most recently, such changes can be effected using the new category of direct composites called small-particle hybrids (Vit-I-escence<sup>a</sup>, Gradia Direct<sup>b</sup>, Esthet-X<sup>c</sup>). This category of direct composite material has been cited in the literature as demonstrating better mechanical, physical (eg, strength, wear, and handling), and optical properties than respective classifications of previously available composites.<sup>7,8</sup> One such Bis-GMA based fluorescent and opalescent composite system incorporates fillers with a particle size of .07  $\mu\text{m}$ , according



### Author

**Frank J. Milnar, DDS**  
Private Practice  
St. Paul, MN

<sup>a</sup> Ultradent Products, Inc, South Jordan, UT 84095; (800) 496-8337

<sup>b</sup> GC America, Alsip, IL 60803; (800) 323-7063

<sup>c</sup> Dentsply Caulk, York, PA 17405-0872; (800) LD-CAULK

to the manufacturer. Additionally, this small particle hybrid, Vit-l-escence, provides the requisite low-translucency, fluorescent dentin composites and high-translucency, opalescent/transparent enamel composites that contribute to the realization of a durable and natural-looking restoration.

The following case demonstrates this material's conservative and minimally invasive application for the closure of anterior maxillary interdental spaces and correction of tooth form.

### Case Presentation

A 24-year-old man presented with a chief concern regarding the large diastema between his maxillary central incisors (Figure 1). In addition, he believed the shape of his upper lateral incisors was too round. Content with the current shade of his teeth—which was determined to be a B1 (Figure 2)—he did not think bleaching was necessary and, although porcelain veneers were discussed as a treatment option to correct the interdental spacing, the patient preferred a conservative and reversible procedure. Orthodontic therapy was declined, though it was also discussed as a viable option.

As part of the thorough examination, radiographs and intraoral and extraoral photographs were obtained, and the patient's periodontal health and occlusion were inspected. Impressions also were taken for the purpose of developing a preoperative study model (Figure 3) and an esthetically enhanced diagnostic wax-up<sup>9</sup> (Figure 4).

The patient was in excellent oral health (eg, the central and lateral incisors were caries- and restoration-free), and no pathologies or interferences were found that would contraindicate diastema closure between teeth Nos. 8 and 9, or shape correction of teeth Nos. 7 and 10, with direct composite placement.

### Preoperative Treatment Planning

The size of the diastema, length and ratios of the clinical crowns, and wear patterns were evaluated.<sup>10,11</sup> This enabled the determination of any areas requiring proximal reduction. In this case, no mechanical preparation was required.

During consultation, the patient reviewed the esthetically enhanced wax-up and accepted the treatment plan, which included closure of the diastema between teeth Nos. 8 and 9 with



Figure 1—Preoperative retracted view revealing the large diastema between teeth Nos. 8 and 9.



Figure 2—The patient's tooth color was found to be B1 according to subjective shade determination using the Classic Vita Shade tabs.



Figure 3—View of the preoperative study model.



Figure 4—View of the esthetically enhanced diagnostic wax-up.

direct composite, and reshaping of teeth Nos. 7 and 10 with direct composite veneers. A putty stent of the enhanced wax-up was then fabricated to serve as a dimensional guide for composite placement and restorative symmetry.<sup>12</sup>



**Figure 5**—View of the color map of tooth No. 9 produced by the colorimeter.



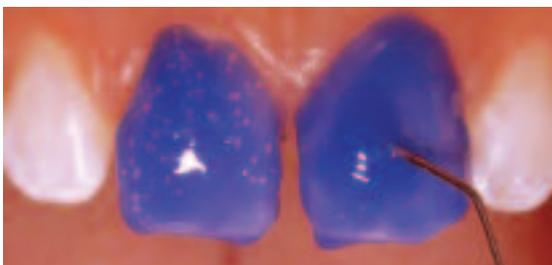
**Figure 6**—Correctional shade mapping was completed using a visual assessment tool.



**Figure 7**—The putty stent, which was constructed based on the enhanced design of the diagnostic wax-up, was previewed in the mouth.



**Figure 8**—The patient's teeth were thoroughly cleansed with a chlorhexidine scrub.



**Figure 9**—The central incisors were etched.

The patient's maxillary central and lateral incisors were thoroughly analyzed to determine the most appropriate composite shades necessary to effect the desired overall esthetic results. For this purpose, a combination of colorimetry (ShadeVision<sup>d</sup>) (Figure 5) and visual assessment (Visual Thinking Strategy<sup>e</sup>) were used to record details of the appearance of the affected dentition (Figure 6). Such details included variations in their hue, chroma, and value, as well as primary characteristics, such as the pre-operative condition of the dentin and enamel, tooth shape, characterizations, and texture.

### Composite Placement

Before initiating restorative treatment, the patient was anesthetized; his lips and cheeks properly retracted; cotton rolls placed for intraoral fluid control; and the putty stent previewed in the patient's mouth before its use (Figure 7). The maxillary central incisors were thoroughly cleansed and scrubbed using an antibacterial agent (Consepsis Scrub<sup>a</sup>) (Figure 8). The uncut enamel was then etched for 20 seconds with 37% phosphoric acid (Ultra-Etch<sup>a</sup>) (Figure 9), rinsed for 15 seconds with an air/water spray, and lightly air-dried. A single-component adhesive bonding agent (PQ1<sup>a</sup>) was applied to the etched enamel for 15 seconds (Figure 10), lightly air-dried for 5 seconds, and then cured with an LED curing light for 20 seconds per tooth (Ultra-Lume LED 2<sup>a</sup>).

Then, the first lingual/proximal layer of composite (Opaque Snow) was placed on both teeth Nos. 8 and 9 to control opacity and prevent show-through. The material was carefully manipulated and shaped, using the putty stent as a guide, to help facilitate later finishing endeavors<sup>13</sup> (Figure 11). This layer was then cured for 10 seconds per tooth.

The dentin replacement layer in shade B1 composite was applied to both teeth and, again, cured for 10 seconds per tooth (Figure 12). Then, before placing the final enamel composite layer, a flowable, light-cured Bis-GMA based composite resin dentin/enamel connector (DE Connector<sup>a</sup>) was placed on both teeth using a flock-tip brush (Figure 13). This composite layer—which was applied in an attempt to increase the value of the dentin composite, enhance nature-mimicking fluorescence, and prevent metamerism—was thinned with an artist's brush and light-cured for 20

<sup>d</sup> X-Rite Inc, Grandville, MI 49418; (800) 248-9748

<sup>e</sup> Visual Thinking Strategy™, Dr. Frank Milnar, St. Paul, MN 55104; (651) 645-6111



**Figure 10**—A single-component adhesive bonding agent was applied and then cured.



**Figure 11**—The first lingual enamel layer of Opaque Snow composite was placed to control opacity and prevent show-through, then strategically arranged and manipulated before curing to facilitate finishing procedures.



**Figure 12**—On both teeth Nos. 8 and 9, the first dentin replacement layer, in shade B1, was placed and cured.



**Figure 13**—A flowable composite dentin/enamel connector was placed and cured before the application of the final enamel layering composite.



**Figure 14**—The final enamel layer of Pearl Frost composite was applied to the mesial build-up of both teeth, then shaped and cured.



**Figure 15**—The incisal edges were finished with an ultra-fine disc.

seconds per tooth. To complete the diastema closure, a final enamel layer of Pearl Frost composite was placed on each tooth, shaped, and arranged (Figure 14). Each restoration was then fully light-cured for 60 seconds from multiple directions.

### **Finishing and Polishing**

Before initiating finishing procedures to create surface texture and tertiary anatomy, a caliper was used to verify the symmetry between teeth Nos. 8 and 9. Then, ultra-fine finishing and polishing discs (Sof-Lex<sup>f</sup>) were used for incisal edge adjustments (Figure 15). The incisal embrasures were opened with a Vision-Flex Disc<sup>g</sup> (Figure 16), and surface texturization was completed using a green Brasseler stone (Figure 17). A final, life-like luster was achieved through the use of a series of high shine polishing cups and points (Jiffy<sup>a</sup>), as well as a goat hair wheel

and .5  $\mu$ m diamond polishing paste (Figure 18).

Once the definitive diastema closure was achieved between teeth Nos. 8 and 9 and verified using the putty stent (Figure 19), veneering of the lateral incisors—teeth Nos. 7 and 10—was then completed in a similarly conservative manner using the same armamentarium and adhesive protocol. Similar finishing and polishing protocols were also performed.

### **Conclusion**

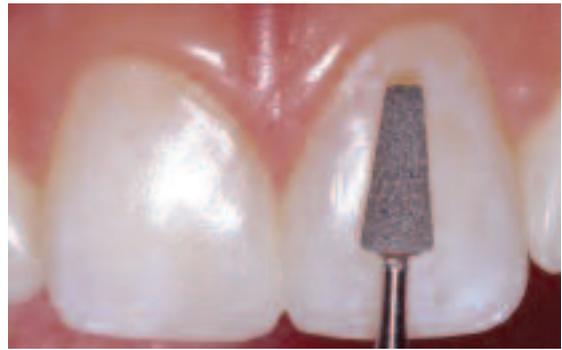
When patients elect to pursue dental treatment to close unesthetic interdental spaces, the incorporation of direct composites into the restorative protocol can provide a minimally invasive way to reproduce missing tooth structure and create esthetic symmetry (Figure 20).<sup>6</sup> Understandably, closure of un-

<sup>f</sup> 3M ESPE, Maplewood, MN 55144-3275; (800) 216-9502

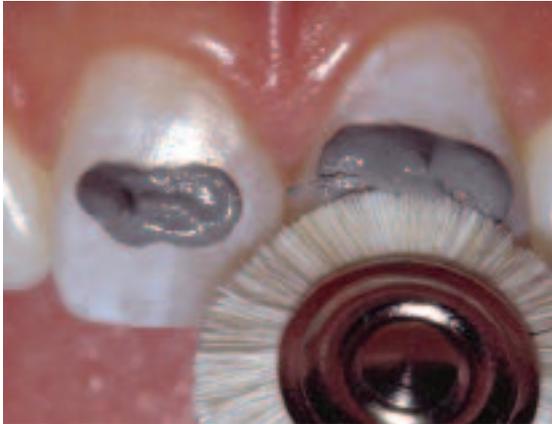
<sup>g</sup> Brasseler USA, Savannah, GA 31419; (800) 841-4522



**Figure 16**—The incisal embrasures were opened using a diamond disc.



**Figure 17**—Final surface texture was imparted using a green stone.



**Figure 18**—A goat hair wheel and .5  $\mu$ m diamond polishing paste were used for final polishing.



**Figure 19**—The form and symmetry of the definitive restorations were verified using the putty stent.



**Figure 20**—Retracted close-up postoperative view of the completed direct composite diastema closure.

wanted and unsightly interdental spaces continues to be one of the most gratifying composite placement procedures for both patients and clinicians.<sup>3</sup> By using an appropriately selected direct composite system in combination with an adhesive design concept that preserves and conserves the tooth-restoration complex,<sup>5</sup> the outcome in this case represents a means to achieve the desired esthetic results while simultaneously minimizing the sacrifice of otherwise healthy natural tooth structures.<sup>4</sup>

### Disclosure

Dr. Milnar has received financial and materials/product support from Ultradent Products, Inc.

### References

1. Chu FC, Siu AS, Newsome PR, Wei SH. Management of median diastema. *Gen Dent.* 2001;49:282-287.
2. Lacy AM. Application of composite resin for single-appointment anterior and posterior diastema closure. *Pract Periodontics Aesthet Dent.* 1998;10:279-286.
3. Croll TP, Cavanaugh RR. Augmentation of incisor width with bonded composite resin: another look. *Quintessence Int.* 1990;21:637-641.
4. Staehle HJ. Minimally invasive restorative treatment. *J Adhes Dent.* 1999;1:267-284.
5. Terry DA, Geller W. Selection defines design. *J Esthet Restor Dent.* 2004;16:213-225.
6. Heymann HO, Hershey HG. Use of composite resin for restorative and orthodontic correction of anterior interdental spacing. *J Prosthet Dent.* 1985;53:766-771.
7. Mopper KW. Maximizing the potential of composite artistry: three decades of direct resin bonding. *Picture Perfect Aesthetics: The AACD Monograph.* Vol. II. Mahwah, NJ: Montage Media Corporation; 2005:95-99.
8. Terry DA. *Natural Esthetics with Composite Resin.* 1st ed. Mahwah, NJ: Montage Media Corporation; 2004.
9. Garcia LT, Bohnenkamp DM. The use of diagnostic wax-ups in treatment planning. *Compend Contin Educ Dent.* 2003; 24:210-216.
10. Lowe E. Simplifying diastema closure in the anterior region. *Dent Today.* 2003;22:50-55.
11. Cordeiro NPD, Martins LRM, de Goes MF, Chan DCN. Conservative technique for closing diastemata and recontouring peg-shaped teeth. *Contemporary Esthetics and Restorative Practice.* 2001;5:16-22.
12. Behle C. Placement of direct composite veneers utilizing a silicone buildup guide and intraoral mock-up. *Pract Periodontics Aesthet Dent.* 2000;12:259-266.
13. Peyton JH. Finishing and polishing techniques: direct composite resin restorations. *Pract Proced Aesthet Dent.* 2004;16: 293-298.