Treating the "Black Triangle" with Direct Composite – a Microscopic Perspective

by David Clark, DDS

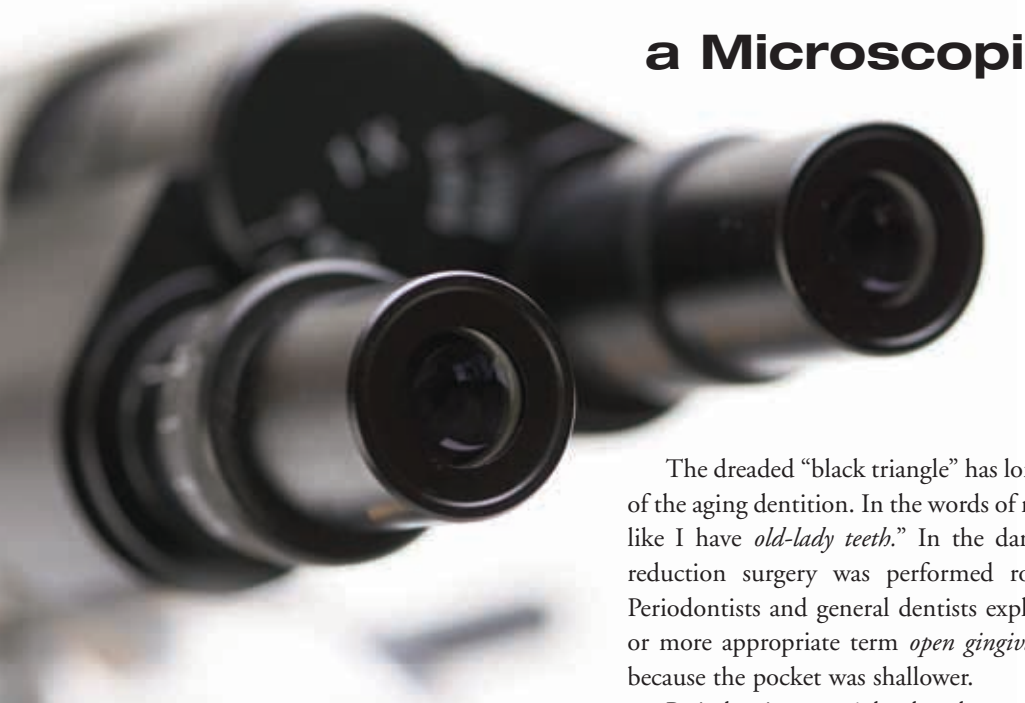

Fig. 1: Pre-operative low-magnification view of full mouth black triangles. Triangular-shaped incisors may have led to the early loss of papillae.

Fig. 2: Six-week post-operative view after restoratively driven papilla regeneration treatment using the balanced application of flowable composite, the Bioclear diastema closure matrices and the injection molding technique.

The dreaded "black triangle" has long been considered unsightly and a sign of the aging dentition. In the words of many of my patients, "It makes me look like I have *old-lady teeth.*" In the dark ages of periodontal therapy, pocket reduction surgery was performed routinely that created black triangles. Periodontists and general dentists explained that the resultant black triangle, or more appropriate term *open gingival embrasure,* was the desired outcome because the pocket was shallower.

Periodontists now joke that they spent the first half of their careers creating black triangles and will spend the last half of their careers trying to fix them.

News Flash: Black Triangles aren't just ugly, they're unhealthy. Black triangles are more than unaesthetic and do more damage than just prematurely age the smile; they also encourage food debris accumulation and excessive plaque.[1] In contrast to the 1980s dogma, we now understand that black triangles can adversely affect the peridontium.[2]

There are many treatment options for this aesthetic and functional dilemma and this article features a case report that utilizes a new tool, the Bioclear Diastema Closure Matrix System and direct composite placement with the benefit of high-level magnification. Implications are substantial when we consider that black triangles are present in more than one third of adults.[3]

Case Presentation

The patient is a 41-year-old female with chief complaint of black triangles. She had consulted with her area dentist and periodontist. They had recommended two treatment plans: first was 16 porcelain veneers to close the spaces; the second, suggested by the periodontist, was multiple perioplastic surgeries. The patient had rejected both treatment plans. She initiated an online search and subsequently read one of the author's previous articles describing the minimally invasive approach outlined in this article.[1,4] Although she lived a great distance away, she agreed to the direct composite approach. A comprehensive evaluation that included tooth position, bruxism, oral hygiene habits and other possible contributory factors were addressed.

Pre- and post-operative views at low magnification (Figs. 1 & 2) demonstrate the dramatic improvement in aesthetics that is possible. Higher magnification (Figs. 3 & 4) reveals that the spaces are not simply

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Fig. 3: 2X pre-operative view of the lower incisors.

Fig. 4: Six-week follow up of the lower incisors. Note that the infinity edge or "Margeas" margins are essentially invisible.

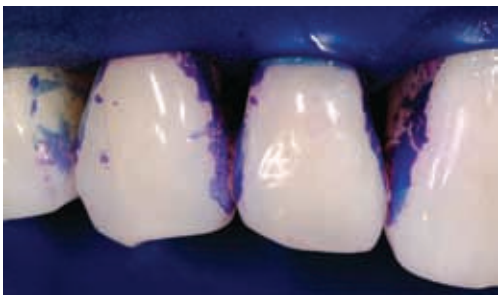

Fig. 5: Disclosing solution demonstrates that in spite of a patient with good hygiene habits, the biofilm in the interdental area is always a problem that must be addressed carefully.

Fig. 6: Low-magnification view of cleaned (blasted) surfaces.

blocked out with composite, but that the papilla has truly been regenerated without the need of surgery.

After a rubber dam was placed, I applied disclosing solution to aid in thorough de-plaquing of the teeth (Fig. 5). Clinicians should be reminded that phosphoric acid placed to etch the tooth *will not* remove plaque and is a leading cause of discoloration and microleakage of bonded restorations. Other than aggressive spraying of the teeth with a mild abrasive (such as a Prophy Jet or Bioclear Prophy Plus), no mechanical preparation of the tooth is necessary (Fig. 6). A new matrix design specific for diastema closure (Figs. 8-10, Fig. 10 on next page), (Bioclear Matrix System patents pending) allows a smooth, yet aggressive, cervical curvature facilitating direct composite architectures that are extremely conducive to papilla regeneration. This is due to two inherent features. The first feature is the ability to forgo a traditional wedge, and to use the papilla as a wedging force (Use of a traditional wedge creates a flat cervical shape. Flat cervical shapes lack the static pressure needed to regenerate papillae). The second feature is a completely appropriate anatomic shape with exaggerated palatal, interproximal, and facial surfaces. This permits the clinician to simply remove the matrix after photopolymerization with little to no interproximal finishing.

When the finish is extremely smooth and there is a lack of a gingival ledge, tissue health can be ideal, even with a very round embrasure form. This modern view of cervical curvature is in sharp contrast to the outdated notion that prosthetic and restorative embrasures should be flat.

Total etch remains as the most robust method when bonding to large enamel areas, especially on uncut enamel. There is no need to stabilize the

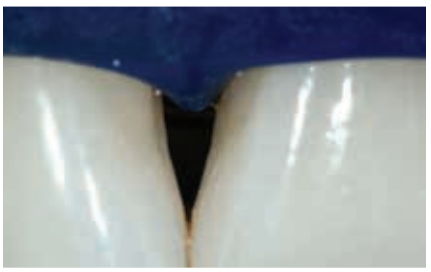

Fig. 7: 8X view of the #7-#8 pre-operative embrasure area. This view demonstrates the extreme challenge of this case.

Fig. 8: Two Bioclear "DC-UFI" matrices in position. These particular matrices have 1.5mm of cervical curvature, therefore when combined a 3mm space can easily be closed.

Fig. 9: 2X view of matrices in position.

Bioclear matrices as they are designed to be self-stabilizing. Alternatively, a metal matrix can be utilized, however it must first be hand burnished and annealed over an alcohol torch (not pictured).

After placing the bonding agent, an initial small increment of flowable composite is carefully injected in both teeth to fill this crucial cervical area (Figure 11). Advanced magnification is of paramount importance for this step. Advanced magnification has become the standard for optimal soft-tissue response. A flowable composite, rather than a paste composite, is preferred for this first increment. A paste composite would be nearly impossible to place in this "claustrophobic" area without voids and without disturbing the matrices.

Paste composite is then injected into the reservoir of uncured flowable composite. This process is referred to as the "snow plow technique" and the "injection molding technique."

The concept of injection molded composite dentistry can be compared to impressioning, in which the low viscosity light body material is syringed into subgingival areas, and then followed and partially displaced by a heavier, high-viscosity impression material that has appropriate physical characteristics. In this technique, successively higher viscosity materials are applied in sequence, and the bonding resin and flowable composite act as wetting agents, which are subsequently displaced by the heavier paste composite material. A more comprehensive explanation of the injection molding technique will be presented in a future article in *Dentaltown Magazine* and further information and clinical videos are available at www.bioclearmatrix.com.

The advantage of anatomically shaped matrices is obvious and a welcomed new tool. Once the matrix is removed, the smooth and extremely durable surface is visible (Fig. 12). The new goal of composite dentistry is to do little or preferably no interproximal finishing. That is because a "Mylar-composite finish" has no oxygen-inhibited layer. We have done microscopic evaluation both

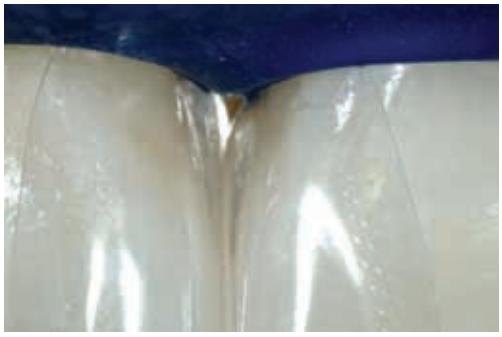

Fig. 10: 8X view of matrices in position.

Fig. 11: 8X view of initial increment of flowable composite placed (from a similar but full diastema closure case).

Table 1: Abbreviated Steps for Black Triangle Elimination and Papilla Regeneration*

1. Teeth are aggressively cleaned with rubber cup and coarse flour of pumice.
2. Rubber dam placement is helpful because it will compress and retract the gingiva.
3. Interproximal areas are aggressively sprayed with pressurized sodium bicarbonate or aluminum trioxide.
4. Appropriate Bioclear matrices are placed.
5. Total etch technique is utilized, 20 seconds on enamel, 10 seconds on dentin.
6. Bonding resin is placed and cured only on dentin after air thinning (Matrix is teased away with brush or explorer to allow access. Some resin on enamel is unavoidable).
7. Bonding resin is reapplied to all areas; air thinned except for gingival area where a small reservoir of bonding resin is maintained.
8. Flowable composite is subsequently injected into the gingival "bonding resin reservoir."
9. Paste composite is subsequently injected from the facial, into the "flowable composite reservoir" displacing as much of the flowable composite as possible toward the palatal.
10. Remove excess material from palatal and then sculpt the facial paste composite.
11. Light cure the continuum all three resin components (bonding resin, flowable composite, and paste composite) together.
12. Sculpt and polish being extremely careful not to over finish the marginal interface.
13. Pre finish with coarse pumice, final finish with diamond impregnated cup Jazz polisher (SS White) or Shape and Shine (Clinician's Choice).
14. High level magnification varying from 2X to 9X is recommended.

** A more comprehensive instructional guide is available from author.*

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Fig. 12: Six-week post-operative view showing complete closure of the black triangle, regenerated papilla and ideal gingival health.

intra-orally and on extracted teeth and discovered that an undisturbed "Mylar" finish stays mirror smooth for years, and even decades. Conversely, interproximal areas that the dentist "polished" are often gouged, rough, and stained.

How Much Magnification is "Enough" Magnification?

In my previous article, "A Microscope for Every Dentist" *(Editor's note: see p. 42 of the January 2010 issue of* Dentaltown Magazine), I described the levels of magnification available for clinical dentistry. A rule of thumb for magnification that addresses the use of composites is listed in Table 2.

Table 2

Clinical Situation	Recommended Compounding Magnification
Tooth colored restorations vs. metal restorations	3X
Subgingival restorations vs. supragingival restorations	2X
Posterior vs. anterior restorations	2X
Indirect (mirror view) versus direct visualization	1.5X

Most dentists using microscopes have found that the levels of magnification they use vary greatly throughout a typical day of general dentistry. Placing an occlusal amalgam on a lower first bicuspid is a far cry from evaluating the subgingival disto-bucccal margin during seating of an all ceramic crown on a maxillary second molar. According to the table, I would need 3 x 2 x 2 x 1.5, or 18 power magnification to see well in that example. And frankly I can barely see that margin at 18X in such a case. And the light *can't* be too bright. Similarly in the case of black triangle treatment, there are moments such as placement of the flowable when microscopic visualization is invaluable.

Summary

Until now there were very few dedicated tools or techniques for restoratively driven papilla regeneration. Previous attempts at both diastema closure and papilla regeneration using direct composites often ended with significant compromise in periodontal health. The interdental papilla serves as both an aesthetic and functional asset, and anatomically ideal interproximal composite shapes can serve as a predictable scaffold to regain this valuable gingival architecture. The reader is strongly cautioned that to attempt this elective procedure using no magnification and without appropriate materials may not be in the patient's best interest, and that non treatment or referral is recommended. This extremely rounded, injection molded composite filling technique is new. Once again, technological advancements allow changes to perform techniques that were previously unthinkable. Slowly, the profession will change its thought patterns, retrain its hands and minds, and allow this substantial clinical evolution in restorative dentistry. ■

Author's Bio

Dr. David Clark founded the Academy of Microscope Enhanced Dentistry, an international association formed to advance the science and practice of microendodontics, microperiodontics, microprosthodontics and microdentistry. He is a course director at the Newport Coast Oral Facial Institute in Newport Beach, California. He is co-director of Precision Aesthetics Northwest in Tacoma, Washington, and an associate member of the American Association of Endodontists. He lectures and gives hands-on seminars internationally on a variety of topics related to microscope-enhanced dentistry. He has developed numerous innovations in the fields of micro dental instrumentation, imaging, and dental operatory design. Dr. Clark has authored several landmark articles about microscope dentistry including Aesthetic Dentistry, Sealants, The Role of Ultrasonics in Three Dimensional Shaping and Restoration of Non Vital Teeth, Micro-Imaging and Practice Management, and Crack Diagnosis. Dr. Clark is a 1986 graduate of the University of Washington School of Dentistry. He maintains a microscope centered restorative practice in Tacoma, Washington. He can be reached at drclark@microscopedentistry.com, drclark@bioclearmatrix.com or www.bioclearmatrix.com.

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