

“The Mother of All Black Triangles” Case, Part I



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Figure 1. Preoperative view of a black triangle case. Note the pursing of lips and forced smile of a patient who is embarrassed of the aesthetics of the lower teeth.



Figure 2. The receded papilla height of the anterior teeth was not significantly lower than that of the posterior teeth, ruling out a surgical approach.



Figure 3. This view demonstrates the unique “twisted butter knife” anatomy of the lower incisor tooth.

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Sometimes a particular case comes along that appears, at first, to be overwhelming. This case fits that description (Figures 1 to 3). However, when this patient e-mailed my office and inquired about the possibility of flying across the country to have me treat him, I had fortunately done many cases involving hundreds of teeth using the matrix system that I developed to treat dentitions afflicted with black triangles, albeit none of this magnitude. I felt absolutely confident that we could achieve a good outcome. The trick was to disassemble the case into bite-sized pieces.

This case presents many excellent questions and the additional challenge of severe facial abrasions. I will first review the background of black triangles and of lower incisor complications and then proceed with the presentation of the clinical procedures used to treat this particular patient.

BLACK TRIANGLES: PREVALENCE AND PATIENT ATTITUDES

One third of adults have unaesthetic black triangles, which are more appropriately referred to as *open gingival embrasures*.¹ Besides being unsightly and prematurely aging the smile, black triangles are prone to accumulate food debris and excessive plaque.² A recent study of patient attitudes found patient dissatisfaction with black tri-

angles to rank quite highly among aesthetic defects ranking third following carious lesions and dark crown margins.³ If you go online and search “dental black triangles,” you will be able to view hundreds of patient black triangle questions and patient complaints/lawsuits resulting from adult orthodontic cases and postperiodontal therapy papilla loss. This clinical and aesthetic dilemma demands more attention from our profession. The caveat is that until now, there has been no disciplined minimally invasive approach for treatment. Today, instead of improvising and struggling, I have developed a specific predictable protocol to treat this problem.

LOWER INCISOR AESTHETICS

The aesthetics of the lower teeth are often overlooked or simply ignored by many dentists. Recently a fellow passenger seated next to me on a flight was intrigued by the photos that were on my laptop. He asked “Why do dentists only seem to treat the upper teeth when the lower teeth look all jacked up? Do they think no one notices? It looks ridiculous to have perfect top teeth and ugly bottom teeth!” In addition, as we age, the lower incisors become more visible as the facial muscles lose their tension on the lower lip.

LOWER INCISOR CHALLENGES AND ETHICS

Lower incisors present their own unique restorative challenges. The incisal edge is broad and thin mesiodistally. The root, in contrast, is very broad buccolingually. Imagine a butter knife that has been permanently twist-

ed at 90° in the middle of the blade. This anatomic curiosity creates demanding draw/path of insertion issues for a porcelain laminate or full crown preparation. A lower incisor with significant recession leads to a mutilatory tooth preparation for porcelain. When I had an opportunity to show this case to the top ceramists in Toronto and Seattle, their answer was refreshingly candid: “Dr. Clark, to treat this case properly with porcelain laminates would require you to mutilate these teeth.”

WHY DO SO MANY DENTISTS MISTRUST COMPOSITE TO TREAT BLACK TRIANGLES?

Like many clinicians, Michael’s (the patient in question) dentist in North Carolina hadn’t heard of Bioclear and was unfamiliar with injection molding of composites. Therefore he was leery of treating Michael with “bonding.” At that point Michael decided to cross the country for a different solution because porcelain veneers and periodontal surgeries did not appeal to him as ideal treatments. After he saw my “Black Triangle” and “Restoratively Driven Papilla Regeneration” articles on the internet and videos on YouTube, he opted to fly to the west coast for treatment.

After spending many hours working with manufacturers and tens of thousands of dentists, I compiled a “top 5” list of composite and porcelain fallacies that have steered dentists away from minimally invasive composite treatments for black triangles, or has doomed their previous attempts leaving them gun-shy to try it again:

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1. "Acid-etching cleans the tooth."

False. Phosphoric acid barely touches plaque. Biofilm is so tenacious and we forget that phosphoric acid removes the mineral, not the organic component of tooth surfaces. Biofilm is organic, not a mineral. This residual biofilm at the margins is likely the number one reason why Class V and interproximal composites turn brown at the margins. No bonding agent can bond to biofilm, and most dentists are leaving biofilm on their hard to access margins.

2. "A stronger dentin bonding agent is the answer."

False. They (the manufacturers) keep selling us new and improved dentin bonding agents with higher and higher dentin bond strengths. The problem is twofold; first of all, in a case like this, most dentists are bonding to plaque, calculus, and contaminated dentin and no current resin bonds to biofilm. Secondly, with an approach using the Bioclear matrix; uncut, blasted, and rinse-etched (with phosphoric acid) enamel is leveraged to provide the bulk of the retention and reliance on the dentin is lessened. We can trust enamel bonding. The key is in the design of the Bioclear Matrix and the ability to "wrap" the tooth with seamless composite jacket.

3. "A full crown is better."

False. If you were the patient with otherwise healthy teeth, would you choose full crowns? Consider that a full crown destroys 70% of coronal tooth volume with a 10% to 20% chance of eventual resultant pulpal death.

4. "A porcelain veneer is better than bonding."

In a case like this, *False.* First, porcelain veneers cannot reach far enough to the lingual, so the space is blocked from view but becomes a plaque trap on the lingual. Secondly, bonding a veneer to this much cervical dentin should make you nervous. Very nervous.

5. "Direct bonding is too difficult."

In the past this may have been true. But today, *False.* In the modern resin era, we utilize anatomic Bioclear matrices coupled with injection molding filling technique with, for example, a universal nanocomposite, thus creating and ideal a flowable/paste interlace.

CASE WORKUP

First, I consulted 2 renowned microscope-equipped periodontists. I would

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Figure 4. High magnification (8x) of the cemento-enamel junction area of the tooth. This area is virtually impossible to clean with a prophy cup and scaler, and virtually unbondable unless the dentin is clean and the surface abraded.



Figure 5. High magnification (12x) view of the root after step 9. Note how the gentle blasting has stripped away the contaminated surface dentin and yet leaves the enamel almost undisturbed.



Figure 6. Bioclear "Prophy Plus" unit snaps to the quick disconnect, and this or a prophy-jet should be part of every bonded procedure's armamentarium.

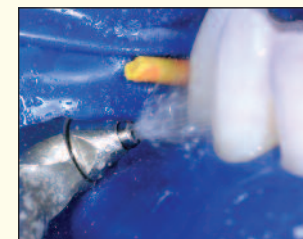


Figure 7. Close-up view of the blasting of the difficult to clean areas. They should also receive the same attention from the lingual aspect (not pictured).



Figure 8. Step 9 view at low magnification. Facial surfaces that previously had large abrasions are at full contour. Cord is still in the sulcus but not visible in photograph.



Figure 9. Yellow ContacEZ lightens the contact, allowing insertion of the matrix and at the same time removes calculus and plaque from the contact area. So integral to the technique, they are now included in the Bioclear Matrix kit.



Figure 10. Bioclear matrix system complete kit includes diastema closure, anterior, and posterior matrices. Mild to wild emergence profiles are coupled with different tooth sizes and incisal shapes. Sabre wedges, Interproximators and other essentials round out the kit.



Figure 11. A Bioclear DC-202 matrix is ready to be placed incisogingivally once the contact is lightened. Note the curved incisal edge and aggressive cervical curvature.



Figure 12. The DC-203 matrix that is especially designed for diastema closure of small teeth. Side view and profile views are featured. Note the straight incisal edge and the aggressive cervical curvature.



Figure 13. Four sectional matrices (Bioclear DC-203 matrices) are placed incisogingivally after the contact areas were lightened and gently abraded.



Figure 14. A 37% Phosphoric acid etchant (3M ESPE) is injected under the matrix on to the tooth. The entire tooth should be etched.

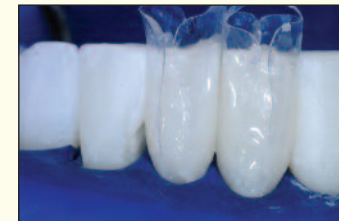


Figure 15. A familiar site to Bioclear users, yet perhaps odd to any "newcomers." The injection molded restoration has interproximal areas that are "porcelain-like" with smooth, rounded contours and flawless surfaces. The facial and lingual surfaces, easy to access and easy to finish, are a little lumpy.



Figure 16. Injection molded canine and bicuspid. Facial finishing is necessary and not difficult. Embrasure areas were difficult to access and easily damaged during finishing before Bioclear. In this case, the embrasure will require little or no finishing.



Figure 17. Low magnification, postoperative view. The cord has been removed.



Figure 18. Close-up, postoperative view. The rubber dam tissue compression combined with the exacting curvature of the Bioclear matrix; together they predictably deliver a regenerated papilla as soon as the rubber dam comes is removed.



Figure 19. A happy patient with a younger looking smile. The patient is an anesthesiologist who was extremely grateful to have received this minimally invasive and maximally aesthetic treatment.

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have normally immediately excluded the surgical option based on this patient's situation but, in this case because of the severity of the embrasures attrition, I felt that second and third opinions were warranted. In addition, if a follow-up surgical approach were needed, the periodontist would already be on board.

Noted periodontist, Dr. Peter Nordlands's summary of this patient: "Dear David, the papilla height across the lower anterior teeth is located at the same level as all of the other adjacent papillae. This means that the individual papillae are not deficient but instead, the patient has suffered incisal edge wear and extrusion of the incisors. Although root coverage could be very predictable, I would recommend a restorative solution as you have so beautifully shown in the Bioclear video. My experience is that surgical papilla reconstruction is most predictable in situations where the papilla has been surgically abused previously."

CASE PRESENTATION

Figure 1 shows the functional and aesthetic dilemma. The retracted view (Figure 2) shows the magnitude of the black triangles on the lower. The patient's first priority was treating the lowers, and he would return to the west coast in a few months to treat the upper black triangles. Facial abrasions and recession tripled the complexity of treatment (Figure 3). Blasting, which is application of a mild abrasive with air water mix, is an absolute necessity for this treatment (Figures 4 to 7). Once the facial abrasions are restored up to the line angle areas, a rubber dam is placed. The interproximal areas are nicely managed with the rubber dam and the DC-203 Bioclear matrices together (Figures 8 to 15). To try to treat the facial abrasions at the same time that the matrices are in position is not recommended. The Bioclear method is almost the inverse of the old flat matrix technique. The facial surfaces are left with some excess because this is the loading area.

The interproximals, when molded, will require little or no finishing (Figure 16). Immediate postoperative views demonstrate the dramatic emergence profiles, mirror finish, and regenerated papillae (Figures 17 to 19). Dentists and periodontists often ask these patients, "Are these veneers? Are these crowns?" No. This is done with an injection molding technique performed with high level magnification using a universal nanocomposite (in this case, Filtek Supreme Ultra [3M ESPE]) (flowable and paste) into the Bioclear matrix, and polishing all with Jazz Polishers (SS White) (Table).

THE MIRROR FINISH: TAKING THE CASE FROM GOOD TO GREAT

Having a mirror smooth composite finish makes everyone happy; the patient, the soft tissue, and especially you, the clinician. The matte or grainy finishes of the past collect lipstick, biofilm, stain, and feel like cheap dentistry to the patient's tongue. In our traditional mindset, only porcelain stayed smooth. Those days need to

end now. Composite has come of age. The first step is to use a microfill that holds its shine. I am nearly always disappointed at how miserable the composite finishing systems are that I am asked to evaluate, and how disappointing many of the composite finishes that are presented in dental journals and magazines. The folks at Kerr, 3M ESPE, and SS White have commented that they have never seen polishes like the ones I show in my lecture. That's probably because most doctors adopt a manufacturer's "system" and frankly, those systems are mediocre at best and grossly overcomplicated. To learn about my unique mirror polish see the *Dentistry Today* video library: "Dr. David Clark's 3 step perfect composite polish technique"

SUMMARY

Before the Bioclear matrix and a disciplined approach to composite treatment of black triangles, many treatments ended with significant compromise in periodontal health. Many cases debonded soon after placement. Others suffered problems with stain. Nonetheless, our patients are hopeful for a better solution. The interdental papilla serves as both a functional and aesthetic asset. Anatomically ideal interproximal composite shapes that are mirror smooth can serve as a predictable scaffold to regain this valuable gingival architecture. Clean enamel surfaces can be leveraged to permanently retain the restorations. However, the reader is cautioned that to attempt this elective procedure using no magnification, without a strict adherence to dentin detoxification with a blasting appliance, and using a flat matrix, nontreatment or referral is recommended. Our profession can change its thought processes, retrain its hands and expand its armamentarium to perform techniques that were previously impossible. ♦

References

1. Kurth JR, Kokich VG. Open gingival embrasures after orthodontic treatment in adults: prevalence and etiology. *Am J Orthod Dentofacial Orthop.* 2001;120:116-123.
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3. Cunliffe J, Pretty I. Patients' ranking of interdental "black triangles" against other common aesthetic problems. *Eur J Prosthodont Restor Dent.* 2009;17:177-181.

Dr. 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

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Table.

CASE WORK-UP

1. Appropriate treatment plan with appropriate fees
2. Treat and fee facial abrasions independently
3. Preoperative whitening
4. Probanthine administered at beginning of appointment

CLINICAL PROCEDURE:

1. Anesthetize, then pack 00 Ultra Pak (Ultradent Products) cord soaked in Hemodent on facial and interproximal areas of teeth with facial abrasions (Nos. 23 to 26)
2. Blast with Bioclear Prophy Plus, (Bioclear Matrix) blast, scale away stubborn calculus, then reblast with aluminum trihydroxide powder
3. Apply disclosing solution
4. Continue blasting until all biofilm is gone and surface dentin has been stripped away
5. Acid etch the entire tooth with 37% phosphoric acid
6. Restore facial surfaces with flowable and paste with the "Clark Class V profile...big, fat, and full." Stop at the line angles
7. Place rubber dam, quickly grind back gross excess areas
8. Lighten and clean contact areas with red or yellow ContacEZ to allow the somewhat delicate Bioclear matrix to slide between the teeth
9. Reblast
10. Place Bioclear Matrices (DC-203 for larger spaces near incisors, A-103 for smaller spaces near incisors, and A-102 for canines and bicuspid near smaller spaces) re-acid etch entire tooth. Seal large areas of dentin with bonding agent, then light cure
11. Injection mold with bonding resin, then Filtek Supreme Ultra Flowable chased with Filtek Paste all in sequence without light curing until the end
12. Gross finish with carbide burs, flame diamonds, and a coarse Soflex Disc (3M ESPE)
13. The Clark 30-second, 3-step polish: (1) Marginate with Brownie, (2) Matte finish with coarse pumice and cup, (3) High shine with Jazz Polisher (SS White).

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is a course director at the Newport Coast Oral Facial Institute in Newport Beach, Calif. He is codirector of Precision Aesthetics Northwest in Tacoma, Wash, 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 microdentistry and minimally invasive dentistry. Dr. Clark is proud to serve on the board of CR (Formerly CRA). He is also developing new techniques and instruments for better endodontic access and shaping, including the Endoguide endodontic access burs. He also developed the Bioclear Matrix System, which allows for biomimetic restoration of teeth using single phase injection molding and minimally invasive preparation styles. A 1986 graduate of the University of Washington School of Dentistry, he can be reached at drclark@microscopedentistry.com and bioclearmatrix.com.

Disclosure: Dr. Clark has a financial interest in the Bioclear Matrix System.

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