

Advanced Techniques for Diastema Closure

A Microscopic Perspective



David Clark, DDS

Clark Dental Group
Tacoma, Washington
Phone: 253.472.4292

Web site: www.lifetimedentistry.net
Email: drclark@microscopdentistry.com

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In dentistry, much of what we do and read is anecdotally driven. Additionally, most clinical assessments over the past century were done with little or no magnification, meaning they were based on incomplete visual information. Our opinions have been shaped by decades of clinical studies about restoration failures, marginal integrity, tissue health, and many other parameters. It seems that our house of dental decision-making has been built on sand.

Today, a small but growing number of dentists are routinely operating with high magnification levels. Once a clinician begins his or her journey using advanced magnification, that clinician may begin to reinvent many procedures (Figures 1 and 2). Users of advanced magnification also may find themselves pressed to problem solve on the fly as they encounter visual cues that are new to them, and neither the problem nor the solution is addressed in mainstream dental publi-

cations. This article will discuss how, when using magnification, some clinicians noted the benefits of a rounded marginal profile. A new anatomic matrix system that this author has developed (Bioclear) and its use with the Injection Molded Composite technique will be detailed.

Magnification provides a squared, not linear, relationship between powers of magnification and “picture elements” or “pixels” of information. In other words, clinicians working at 3.5x see 10 times more visual information, and at 10x clinicians see 100 times more than with the naked eye. If clinicians move to 25x for brief periods of observation throughout the clinical day, they will see 625 times more than with the naked eye¹ (Table 1).

Ethics and Diastema Closure

Many esthetic procedures can improve the structural integrity of the tooth and also facilitate better health of the surrounding gingiva. Diastema closure, at least in the

Table 1—Magnification and Visual Information

Magnification	1x	2x	4x	10x	16x	25x
Information Content	1x	4x	16x	100x	256x	625x
Picture Element	660	2640	10,560	66,000	168,960	412,500

Table 2—Microscopic Protocol for Margin Evaluation of Porcelain or Composite

(x) Sub	↔	Plus
(y) Undercontoured Emergence Profile	↔	Rounded Emergence Profile
(z) Short	↔	Long

- x **Sub** is an underhang (shelf of tooth structure)
Plus is an overhang (shelf of restorative material)
- y **Undercountered Emergence Profile** is concave at the enamel and cementum intersection
Rounded Emergence Profile is convex, causing a “potbelly” effect, at the enamel and cementum intersection
- z **Short** occlusal–gingival line
Long occlusal–gingival line
- Ideally, a restoration margin should be centered along the 3 axes (↔).

Table 3—Parameters for Maximizing Total Potential Tissue Health

- No residual cement or calculus apical to finish lines
- No root roughness from errant bur movements
- No microroughness or porosities of porcelain or composite
- No microleakage

Not avoiding these parameters can create an excessive bioburden, compounding any negative alignment on the axes in Table 2.

Tables 2 and 3 adapted from: Clark DJ, Kim J. Optimizing gingival esthetics: a microscopic perspective. *Oral Health*. April 2005;95:116-126.

anterior sextant, does not give either of these secondary benefits. Sadly, the esthetic diastema closure often results in significant compromises in the root–crown architecture, and increased plaque retention with subsequent deterioration in periodontal health. Increased caries activity often follows. Any discrepancy greater than 50 μm will cause untoward tissue response.²⁻⁵ When using advanced magnification, clinicians found that a bulbous contour is actually far less detrimental than other often ignored and clinically unseen factors.⁶ To “do

no harm” performing elective diastema closure, clinicians must elevate their game.

Tables 2 and 3 highlight a magnification-based approach to the multiple factors that determine the gingival reaction to prosthetic and restorative intervention into the sulcus and pericrestal zones. Once clinicians begin to analyze margins with advanced magnification, they can begin to discuss margins in 3 axes—x, y, z—(Table 2). Also, clinicians can see how certain parameters can affect the bioburden on gingival tissue,

resulting in chronic tissue inflammation. Table 3 lists the parameters to be avoided because they will “tip the scale” and create an excessive bioburden, compounding any negative factors from a poorly constructed margin junction.

Extreme Diastema Closure

When patients ask that large diastemas be closed, alternative choices should always be discussed; however, patients will sometimes choose the most expedient option, such as direct composite. When faced with this challenge, clinicians have limited options:

Option 1—No Matrix: In the severe diastema case featured in this article, it appears that the previous clinician used the papilla as the gingival matrix. This resulted in a good esthetic space closure, but a biologically horrific contour (Case Photos 1 through 4). A sharp 90° angle combined with a lumpy and porous surface created a poor environment for soft-tissue health. Note the torrent of blood visible as the removal of old composite is performed (Case Photo 5).

Option 2—With Matrix, With Wedge: The problems with traditional clear mylar strips are that they are flat and require wedging, do not conform to the tooth, and are nearly impossible to maintain deep in the sulcus. The result is often an esthetic compromise. Holding all 4 ends of the strips while simultaneously light-curing is always a challenge (Figures 3 through 5).

Option 3—With Matrix, Without Wedge: This approach can yield the worst of both worlds, incomplete space closure and gingival overhang.



Figure 1—Author using an operating microscope with multiple levels of magnification—2.5x, 4x, 6x, 10x, 16x, and 24x. Xenon coaxial light provides shadowless, ideal illumination in previously inaccessible visual environments, such as deep in the sulcus.



Figure 2—After sharpening a red wax pencil at 24x, die trimming and margin identification was performed at high level (8x - 12x) magnification. The cleaner the margin, the better the tissue response and the deeper in the sulcus you can safely operate.



Figure 3—Midtreatment view of a composite replacement on tooth No. 8. Note the flat mylar strip does not conform to a round tooth

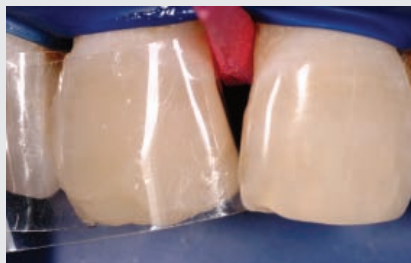


Figure 4—Wedge placement only exacerbates the flat contour.

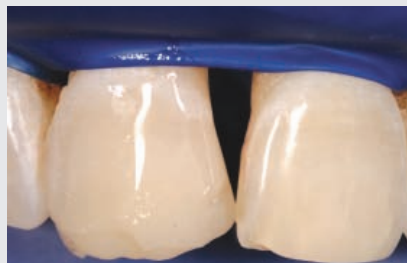


Figure 5—Flat embrasure, gingival diastema, and point contact are classic dilemmas of traditional anterior composite technique. This central incisor embrasure has hygienic contours, but a black triangle at the gingival embrasure.



Figure 6—Bioclear matrix on tooth No. 8.



Figure 7—The injection of a flowable composite into the matrix.



Figure 8—The injection of a paste composite into the matrix.



Figure 9—In this extreme diastema closure, maxillary Bioclear matrices are modified and slide to the depth of the sulcus without lacerating the tissue. Note the tissue blanching. Also note that the anatomic shape allows hands-free and wedge-free use as the matrices hug the teeth.



Figure 10—Immediately after using the injection molding technique, the matrices move nicely to close the incisal gap but continue to hug the cervical area of the teeth. The sulcus itself provides stabilization.

Option 4—Bioclear Matrix System and Injection Molded Composite technique: With this technique, the Bioclear matrices intimately adapt to the gingival margins and duplicate full rounded contours (Figure 6).

1. Use the total-etch technique on the preparation.
2. Place a lightly filled bonding resin, such as OptiBond Solo Plus (Kerr Corporation).
3. Inject a flowable composite (Figure 7).
4. Inject a paste composite (Figure 8).
5. Light-cure all 3 resins together for a seamless filling (Figures 9 and 10).

Case Report

The featured case demonstrates retreatment of a classic iatrogenic diastema closure. A 29-year-old woman



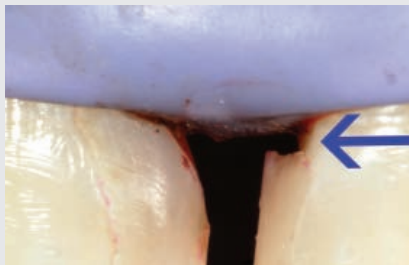
Case Photo 1—Preoperative view. Note the dingy interproximal space between teeth Nos. 8 and 9.



Case Photo 2—Preoperative view. Pigmented tissue camouflages the cyanotic tissues.



Case Photo 3—Prewedging compresses the papilla and allows enhanced visualization of the sulcus.



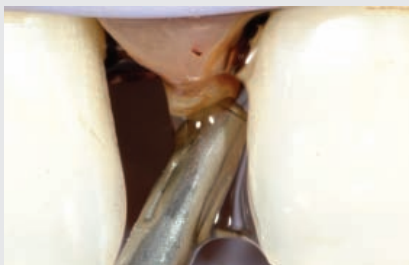
Case Photo 4—After 3 minutes the wedge was withdrawn to reveal unacceptable previous treatment and offending sharp ledge of composite. Vision, retraction, and tissue manipulation are subtle building blocks in modern microdentistry.



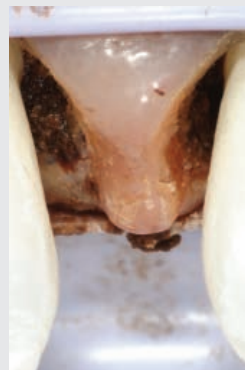
Case Photo 5—Significant hemorrhage associated with the well-intentioned but iatrogenic composites.



Case Photo 6—Old composite was removed and the area was sprayed with sodium bicarbonate (Prophy-Jet, Dentsply International).



Case Photo 7—High magnification (16x) view of Case Photo 6.



Case Photo 8—Tissue was stabilized with ferric sulphate (Ultradent Products Inc). Fluid control must be absolute because no wedge will be used.



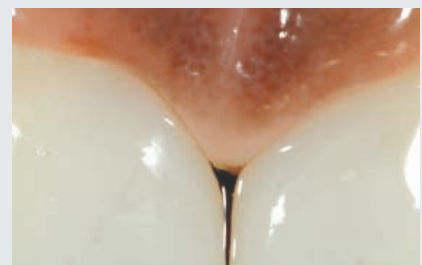
Case Photo 9—Bioclear matrices in position. Note that they are used hands-free and wedge-free.



Case Photo 10—Immediate postoperative view. Final polish was accomplished with a combination of discs and rubber points.



Case Photo 11—The final restorations, 2 weeks after treatment.



Case Photo 12—High magnification (16x) view of Case Photo 11.

reported with chief complaints of oral malodor, bleeding gums, brown stain, floss shredding, and incomplete dia-

stema closure in the area of teeth Nos. 8 and 9. The patient desired complete diastema closure and resolution of the

above mentioned problems. She had previously received composite restorations to close her diastema. A plan including

preprosthetic orthodontics to evenly distribute the spacing followed by porcelain laminates was presented to the patient. She declined the comprehensive approach and was given informed consent regarding the esthetic compromises before beginning treatment.

The treatment plan chosen was to place Bioclear matrices with the Injection Molded Composite technique. First, the old composite was removed with a coarse flame-shaped diamond. Then the gingiva was lightly sculpted to create space for the delicate Bioclear sectional matrix (Case Photos 6 through 8). This sculpting can be accomplished with a mini tip and electrosurgery, laser, or sodium bicarbonate spray. In this case, sodium bicarbonate spray was used to simultaneously sculpt tissue and clean and detoxify the sickly cemento-enamel junction surfaces.

Next we see an occlusal view of the Bioclear matrix (prototype stage) with rounded, anatomic adaptation to the root (Case Photo 9). No wedge is required to press the matrix to position.

The immediate postoperative result is featured in Case Photo 10. Because the patient had chosen “young” incisal mamelons from the tooth library, the teeth were lengthened and mamelons with vertical grooves to mitigate the squareness of the tooth were built into the anatomy.

Two-week follow up (Case Photos 11 and 12) showed improved tissue health in spite of the fact that the gingival contours are far more bulbous than in the first treatment.

Conclusion

The “magnification escalation” in dentistry is likely to continue. With advanced magnification, there are pre-

viously unthinkable possibilities. The extreme diastema closure represents one such possibility. New techniques and instruments are currently being developed to meet the needs of this growing segment of practicing dentists. The concept of rounded marginal profiles with exquisite tissue health is a significant departure from the past. Restorations created using the Injection Molded Composite technique and with anatomically specific matrices are a glimpse into the future.

Disclosure

Dr. Clark has financial interest in Bioclear and Interproximator matrix system components.

References

1. Mora AF. Fundamentals of advanced magnification. Presented at: The Academy of Microscope Enhanced Dentistry Scientific Session; November 4-6, 2003; Scottsdale Ariz.
2. Lang NP, Kiel RA, Anderhalden K. Clinical and microbiological effects of subgingival restorations with overhanging or clinically perfect margins. *J Clin Periodontol*. 1983;10:563-578.
3. Clark DJ, Kim J. Optimizing gingival esthetics: a microscopic perspective. *Oral Health*. 2005;95:116-126.
4. De Boever JA, De Boever AL, De Vree HM. Periodontal aspects of cementation: materials, techniques and their biologic reactions [in French]. *Rev Belge Med Dent*. 1998;53:181-192.
5. Sorensen SE, Larsen IB, Jörgensen KD. Gingival and alveolar bone reaction to marginal fit of subgingival crown margins. *Scand J Dent Res*. 1986;94:109-114.
6. Sorenson JA. A rationale for comparison of plaque-retaining properties of crown systems. *J Prosthet Dent*. 1989;62:264-269.

Product References

Product: Bioclear*
Manufacturer: Bioclear Matrix Systems of David Clark, DDS, Inc
Location: Tacoma, Washington
Phone: 253.961.4935
Web site: www.drclarkdds.com
 *The Bioclear Matrix System is in final prototype stage and available in limited numbers.

Product: OptiBond Solo Plus
Manufacturer: Kerr Corporation
Location: Orange, California
Phone: 800.537.7123
Web site: www.kerrdental.com

Product: Prophy-Jet
Manufacturer: Dentsply International
Location: York, Pennsylvania
Phone: 800.877.0020
Web site: www.dentsply.com

Product: ferric sulfate
Manufacturer: Ultradent Products Inc
Location: South Jordan, Utah
Phone: 800.552.5512
Web site: www.ultradent.com

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