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The Architect of the Smile

A Midline Diastema Closure

INTRODUCTION

One of the most common aesthetic procedures encountered by general dentists today is diastema closure. A midline diastema can be the result of a single or multifactorial etiology of tooth-size-to-arch-space discrepancy, supernumerary teeth, labial frenal attachments, and oral habits. The interproximal spacing between 2 maxillary central incisors causes a visual disruption and is often regarded as unaesthetic, affecting the entire face. But what is it exactly that causes this space, regardless of how narrow or wide between the maxillary central incisors, to so strongly influence aesthetics? The answer is that a midline diastema deals with the ophthalmic physiological principle of duality that is seen in architecture.

In an aesthetic smile, small variations in symmetry can be acceptable. However, the 2 maxillary central incisors must have complete bilateral symmetry as they are the dominant teeth in the smile. Bilateral symmetry is the most common form of symmetry in architecture that has been present for thousands of years, as seen in the facades of the Pantheon in Rome and the Acropolis of Athens.¹ An even number of columns is present on the facades of these ancient buildings, which allows for a bilateral symmetry when the facade is divided into 2 equal halves. If there were an odd number of columns on the facades of these buildings, the central axis of the facade would run along the middle of a column, as opposed to an open bay, and thereby create dualism, or competing aesthetics, for your eyes to interpret.

Duality or dualism in architecture is considered something to be avoided and a “classical and elementary blunder” and is identified with the “ambiguous and amorphous.”^{1,2} An example of duality in architecture would be building a house with 2 front doors, which would create confusion.¹ Like a house with 2 front doors or an ancient building with an odd number of columns, a midline diastema creates confusion as the eyes do not know which central incisor to focus on. As architects of the smile, dentists must resolve this aesthetic dilemma of duality by closing the diastema. If a natural-looking smile with no interproximal spacing is the goal, proper treatment planning is essential for achieving predictable aesthetics.

CASE REPORT

Diagnosis and Treatment Plan

A patient presented with discontent over his midline diastema, desiring a closed midline with the maxillary centrals touching (Figures 1 to 3). Whenever an interruption occurs between the color transition from the pink attached gingival and papilla to the white tooth and to the natural incisal embrasure (in the form of a black triangle or diastema), the eye is drawn to the negative space. If the eye sees no color interruptions in this symmetrical transition, the smile is perceived as harmonious and healthy. However, if a visual disruption is present, dissonance and disease is perceived. While fundamental guidelines in aesthetic treatment planning must be followed, it should be acknowledged that individual cultural characteristics, perceptions of beauty, and wide varieties of natural teeth proportions must all be considered when restoring maxillary anterior teeth.³ Whenever treatment planning for the midline diastema, one must consider the following: position and shape of teeth in the arch, mesial-distal width of the diastema, gingival architecture and papilla form, prep design, and restorative material. Finding the balance between conservative and minimally invasive treatment and a long-lasting functional and aesthetic solution is crucial.

The first step in treatment of the midline diastema is identifying the width of the interproximal space to be closed. While simply adding width to the mesial surfaces of the central incisors will close the space, if done, the width-to-height ratio increases, and an unnatural, boxy-looking tooth is often the result. Managing width-to-height ratios of teeth in the aesthetic



Figure 1. The patient presented with a desire to close his midline diastema.



Figure 2. The patient's smile, showing spacing between the central incisors.



Figure 3. The retracted view, demonstrating diastema and gingival contours.

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Figure 4. The 0.5-mm depth cuts were identified with a permanent marker.



Figure 5. An exact 0.5-mm depth reduction was achieved once the permanent ink markings were removed with a round-ended diamond (No. 112-5161 [Henry Schein]).



Figure 6. A 0.3-mm depth cut was identified using a permanent marker.



Figure 7. After the permanent marker markings were removed, a uniform 0.8-mm total facial reduction was obtained.



Figure 8. The incisal edge was reduced by 1.5 mm.



Figure 9. A polishing cup (Shofu Dental) was used to smooth and polish all line angles.



Figure 10. The occlusal view of the finished veneer preps.



Figure 11. The lingual view of veneer restorations, showing natural emergence profiles.



Figure 12. The provisionalization of teeth Nos. 8 and 9 with the diastema closed.



Figure 13. A postoperative, full-face view of the final outcome for our pleased patient.



Figure 14. The post-op smile, showing the closed diastema.



Figure 15. The post-op retracted view.

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zone by following a golden proportion and reestablishing new line angles and gingival contours will provide a natural-looking smile. Depending upon the space to be closed, orthodontic repositioning, a direct or indirect restoration, or a combination of these treatment options should be considered. If the patient desires an immediate aesthetic improvement that is predictable and a long-term solution, indirect veneers are indicated. In this case, 2 all-ceramic lithium disilicate (IPS e.max [Ivoclar Vivadent]) veneers were selected due to the lifelike optical properties and strength of the material.

Clinical Protocol

When closing a midline diastema, if the space between the maxillary central incisors is the only interproximal spacing present in the maxillary arch, control of the heights of contour, gingival zenith, line angles, and emergence profiles is key. Since diastema closure is the aesthetic objective, it is necessary to establish a new gingival emer-

gence profile that is not over-bulked, does not create a black triangle, and does not have an excessively long inciso-gingival contact point. Gingival and osseous contours dictate how one should proceed with treatment.

In this patient's case, a healthy "V"-shaped papilla between teeth Nos. 8 and 9 was present as well as healthy, scalloped osseous architecture (Figure 3). The width of the diastema to close was equally divided between teeth Nos. 8 and 9 by appropriate preparation design and reestablishing new facial line angles. Tooth structure conservation, while keeping proper function and aesthetics in mind, is always an objective in prep design. A 0.5-mm depth-cutting diamond (Maxima Diamond No. 9000-7136 [Henry Schein]) was utilized first to achieve a 0.5-mm facial reduction for the veneer prepara-

tions (Figure 4). The black permanent ink identifies the depth cuts, and a round-ended diamond (No. 112-5161 [Henry Schein]) was used to remove the enamel until no markings remained, thus achieving precisely the desired 0.5-mm reduction (Figures 4 and 5). A 0.3-mm depth-cutting diamond (Maxima Diamond No. 9000-7135 [Henry Schein]) was used next, followed by the round-ended diamond to attain exactly 0.8 mm of facial reduction (Figures 6 and 7). Interproximal reduction was performed with cleared contacts, placing the distal margin on the distolingual aspect of the teeth and placing the mesial margin wrapped around the mesiolingual aspect of the teeth. Location of the mesiolingual margin is the most critical aspect of preparation design for midline diastema closure with veneers. It is key to make sure that, when preparing central incisors for diastema closure with veneers, the mesiolingual margin placement provides the ceramist with enough of a gradual transition from natural tooth structure to the necessary porcelain contour to close the space, avoiding having an abrupt transition to bulky

porcelain. Placing the interproximal margins on the lingual for veneer preparations increases retention form, allows the ceramist space to add interproximal characterization and resolve midline discrepancies, and places the margin in a free-cleansing area.⁴

A round-ended diamond (No. 112-5161 [Henry Schein]) was used to achieve a 1.5-mm incisal reduction, and a Shofu Dental polishing cup was used to smooth and polish all line angles (Figures 8 and 9). Keeping the margin as apical as possible without infringement on the biologic width of the mesiofacial and mesiolingual aspects of the preparation also allows for a natural-looking emergence profile that the ceramist can use to close the interproximal space and create the contact point without a black triangle (Figures 10 and 11).

A centric relation bite registration was taken with a fast-set vinyl polysiloxane bite registration material (Regisil Rigid Super Fast Set [Denstply Sirona]), and, to obtain hemostasis for the final impression, retraction paste (Expasyl [Kerr Dental]) was placed around the margins, left in place for 10



Figure 16. A close-up view of the completed case.



Figure 17. The right lateral view of the completed case.



Figure 18. The left lateral view of the completed case.

minutes, then rinsed with water and dried. A thermoplastic matrix fabricated from the diagnostic wax-up was used to fabricate the provisionals (Luxatemp [DMG America]). A compatible clear resin glaze material (LuxaGlaze [DMG America]) was applied over the provisionals to create a lifelike enamel appearance (Figure 12). The patient was dismissed from the office.

At the delivery appointment, the 2 lithium disilicate (IPS e.max) veneers (artistically designed by John Wilson of Wilson Dental Arts in Raleigh, NC) were tried into place. To eliminate salivary phosphate contamination from the intraoral try-in, a universal cleaner (Ivoclean [Ivoclar Vivadent]) was applied to the intaglio surfaces of the veneers and left in place for 20 seconds, then rinsed and air dried with oil-free air. Next, one drop of Silane Primer (Kerr Dental) was applied and air dispersed. The preparations were acid etched (Etch-Rite 38% phosphoric acid gel [Pulpdent]) for 20 seconds, then rinsed thoroughly and dried with oil-free air. Then several coats of Dentin Desensitizer (Pulpdent) were applied (per the manufacturer's directions). Next, one coat of primer (OptiBond FL [Kerr Dental]) was placed on the preparations and air-thinned; this was immediately followed by several coats of adhesive, which were air-thinned and light-cured using a plasma arc curing light (Sapphire Plus Plasma Arc [DenMat]) for 20 seconds. A dual-cure resin cement (Calibra Esthetic Resin Cement [Dentsply Sirona]) was then utilized for final cementation. A red-striped 30-grit diamond (Brasseler USA) began the finishing process around the facial aspect of the margin, followed by a white-striped 30-bladed finishing bur (Brasseler USA), with red- and white-striped finishing footballs (Brasseler USA) used to

finish the lingual margin. Finally, the occlusion was assessed and adjusted as needed, and the margins were polished with the gray, pink, and then yellow Shofu Dental polishing points.

CLOSING COMMENTS

Managing dimensions and space by proper evaluation and control of gingival and restorative material contours are of the utmost importance for treating the midline diastema. As an architect of the smile, the general dentist must develop a blueprint for a predictable aesthetic result. The goal for treatment planning any case is to provide patients with the least invasive treatment option to meet aesthetic expectations while providing a biocompatible solution.

Today's modern microfill composites, used with pre-contoured matrices

or layering techniques with characterization tints, can achieve a polished surface equally aesthetic to porcelain with excellent marginal adaptation. With the improved polishability of microfill composites, stain resistance has also improved over the years. In a discussion related to the selection of a restorative material, this particular patient was very concerned about the strength of the restoration and also desired a restorative material with the least potential for staining.

Ideal prep design must allow a skilled ceramist to be able to create natural contours that harmonize with the surrounding soft and hard tissues and the patient's face. As with all midline diastema cases, the patient was informed that a change in the air permitted to escape between the central incisors during speech can be affected

by diastema closure, thus requiring a short accommodation period, particularly for words beginning with "S" sounds. The patient and all involved with the case were pleased with the outcome (Figures 13 to 18).♦

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References

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