PROFILE



Dr. Gerald E. Denehy

Current Occupation

Professor and chairman, Department of Operative Dentistry, University of Iowa College of Dentistry

Education

Loma Linda University, 1968, DDS University of Iowa, 1970, MS Operative Dentistry

Professional Memberships

American Academy of Cosmetic Dentistry American Academy of Dental Research American Dental Association American Dental Education Association (ADEA) Omicron Kappa Upsilon

Positions Held

President, Operative Section of ADEA Consultant for dental companies Editorial board member and reviewer for dental publications

Honors/Awards

Teacher of the Year awards Gordon Christensen Recognition Lecturer Dental Alumnus of the Year, Loma Linda University Iowa Dental Educator of the Year

Publications

Over 100 publications on resin composites, esthetics, and dental education

Contributions to Dentistry

Worked with resin composites for 35 years, most with freehand bonding Wrote one of first published articles on bonded cast appliances Involvement with graduate program, University of Iowa, which has graduated over 50 dental educators

Personal Interests

Biking, cross-country skiing, outdoor recreation in general

Masters of Esthetic Dentistry

SIMPLIFYING THE CLASS IV LINGUAL MATRIX

Gerald E. Denehy, DDS, MS

irect resin composite systems are enjoying resurgence in modern restorative dentistry.^{1,2} Reasons for this increased use are many, and include improved bonding systems, home bleaching, and a new emphasis on conservative dentistry. Manufacturers now provide the practitioner with esthetic resin systems that have excellent physical properties of strength and polish, resulting in greater longevity for the final restorations.^{3,4} In addition, many of these systems offer a selection and variety of shades and opacities that provide the dentist with the ability to create esthetic restorations, much as a ceramist would with porcelain.^{5,6}

The proper use of these materials, however, requires a degree of training and acquired skill on the dentist's part to properly incorporate the shades and opacities and to place them in the correct locations. When freehand bonding, the dentist has the freedom to sculpt the material to the desired shape and thicknesses.^{7,8} Unfortunately, many of the direct resin composite restorative systems do not lend themselves well to the freehand technique owing to properties of slump or stickiness. Without extensive training, the average practitioner has

difficulty using them in an efficient manner. Therefore, establishing the final contour involves more of a shaping of the final restoration during finishing rather than its construction during placement.

In the past, dentists have used many forms of confinement to speed placement and simplify the confinement of the material when placing Class IV restorations. These include crown forms of various types and celluloid matrix strips. The resin composite material is bulk loaded, polymerized, and then shaped to contour. These methods, although expedient, provide the dentist with little opportunity to build up the restoration in a toothlike manner, reproducing the multichromatic layering found in anterior teeth.

Recently, clinicians have described a technique that uses a mold of an ideal mock-up of the desired restoration to provide a framework for rebuilding the missing tooth structure.^{9,10} This technique is called the lingual matrix. The lingual matrix has several advantages. When properly constructed, it establishes the entire lingual contour of the restoration during material placement, resulting in minimal finishing. It also establishes the incisal length and facilitates the placement of an incisal halo and the incorporation of appropriate translucencies in the correct area. Its framework allows the dentist to quickly construct the different multichromatic layers necessary in their correct thicknesses to properly produce the dentin opacity and overlying enamel translucency. Finally, and perhaps most importantly, it allows a dentist to use a material regardless of its slump or viscosity in a controlled manner, greatly facilitating the finishing process.

The major disadvantage of the lingual matrix is that for it to work well, it must be constructed properly. In other words, the matrix must reproduce on the lingual and incisal aspects the contours and length desired in the final restoration. Unfortunately, this situation rarely exists in the mouth, with the exception of restorations with a proper contour that are replaced for shade discrepancies such as those produced when bleaching teeth.

Although an impression may be taken of the teeth preoperatively, a model constructed, and the proper contour waxed in, this is impractical for many dentists, both from a time and fee reimbursement standpoint. A more practical option is a method in which the correct contour can be quickly established in the mouth, from which the lingual matrix is constructed.

This article reviews the important aspects of the lingual matrix,

describes methods to quickly construct it, and provides instruction as to its most efficient use.

PROCEDURE

The lingual matrix should be easily placed and removed from the teeth. It should provide accurate details of the tooth surface and be constructed of a material that sets quickly in the mouth. The most commonly recommended materials for construction of the lingual matrix have been silicone putty impression materials. An excellent intraoral alternative is one of the new quick-set polyvinyl siloxane impression materials that harden in 30 seconds in the mouth (Template, Clinician's Choice, New Milford, CT, USA).

The important elements to be reproduced by the lingual matrix are the lingual and incisal portions of the tooth to be restored, along with a correct relationship with the adjacent tooth. The matrix should extend just below the gingival margin on the lingual aspect of the teeth and should cover at least one tooth on either side of the tooth to be restored to provide a solid seat. When forming the matrix, the facial contours of the teeth are unimportant since they are not covered. However, the matrix should cover the incisal edge to the facial incisal margin (Figure 1). Any excess matrix can be removed with a scalpel blade after the material has set. It is not necessary to lubricate the teeth when constructing the matrix, nor is it necessary to lubricate the matrix when placing the resin restoration.

If the dentist is unable to use the existing restoration or is unwilling to take an impression and wax a model of the desired restoration, a modification of the existing restoration or a quick mock-up of the desired restoration may be accomplished intraorally. A facial shell is constructed by mocking up directly on the tooth without etching (Figure 2). The dentist uses a finger to apply pressure on the lingual aspect to keep the shell slightly under the desired lingual contour (Figure 3). This allows the refinement of the lingual contour in the next step. A small amount of sculptable resin composite is placed on the facial aspect of



Figure 1. Correct coverage of the lingual matrix.

the tooth (Figure 4), pressed directly against the finger, and overlapped on the facial portion (Figure 5). The facial contour is unimportant, but the incisal contour should be approximately the desired length. After polymerization, the finger is lifted and the undercontoured facial shell allows room for the final refinement of the lingual marginal ridge and embrasure area (Figure 6). The contact is separated by a slight torquing of the teeth, and a celluloid matrix strip is inserted (Figure 7). A small amount of material is added to the lingual contour (Figure 8), and the strip is closed over the lingual aspect again with finger pres-





Figure 2. Incisal view of the fractured tooth needing a mock-up.





Figure 4. Resin placed on the non-etched facial surface.



Figure 5. Resin pushed against the finger to establish contact.



Figure 6. Polymerized resin ready for the addition of the lingual contour.



Figure 7. Contact is separated and a celluloid strip inserted.

Figure 8. Resin placed to establish the lingual contour.

sure, as one would do when placing a Class III restoration (Figure 9). With the finger still in place (Figure 10), the strip is pulled to the facial aspect, establishing the desired lingual contour (Figure 11). Any slight excess can be removed and the surface blended with a football burnisher. The resin is polymerized, and any incisal length adjustment is made with a sandpaper disk (Figure 12). Once the desired lingual contour





Figure 9. Strip pressed into lingual fossa to establish the lingual contour.

Figure 10. Finger pressure for adaptation and marginal ridge contour.



Figure 11. Strip pulled out to the facial aspect and material polymerized.

and incisal length are achieved (Figure 13), the matrix is constructed. After the impression material has polymerized, the matrix is removed along with the resin mock-up addition, and the tooth is ready for preparation and restoration.

CASE REPORT

A clinical case is presented with an existing Class IV restoration that needs to be replaced (Figure 14).

Since the restoration is undercontoured, a modification is made of the restoration by adding resin to achieve the desired length and lingual contour (Figure 15). A polyvinyl siloxane quick-set impression material is used to form the matrix (Figure 16). Once the matrix has been constructed and removed, the tooth is prepared for the restorative material. In most Class IV situations, this involves a facial bevel of

2 mm or more ending in an infinity margin. The lingual bevel should be approximately 1.5 mm long and should be started at the dentinoenamel junction. Once the preparation is complete, the matrix should be tried back in the mouth to verify the fit (Figure 17). At this time, the dentist should note the extension of the lingual bevel on the matrix and make a small mark with the explorer tip to define the resin extension coverage. The matrix is again removed, the tooth properly conditioned, and the bonding system of choice applied.

The resin shell is prepared by laying a thin layer of resin composite against the missing tooth structure area in the matrix. Material selection should typically be light in shade and high in opacity. This aids in blocking shine-through and produces a white halo effect on the



Figure 12. Excess on the incisal aspect requiring recontouring.



Figure 13. Completed mock-up ready for matrix construction.



Figure 14. Preoperative view of an existing Class IV restoration on the maxillary left central incisor.



Figure 15. Restoration modified for intraoral construction of the lingual matrix.

incisal edge. The shell material should be approximately 0.3 mm thick and should be extended to the incisal edge and just past the mark gingivally on the lingual matrix defining the gingival-most extent of the preparation. The resin should completely cover the missing tooth portion, but care should be taken not to cover the marginal ridges into the contact area of the adjacent tooth.

The lingual matrix with its thin layer of resin is firmly seated in place and

held securely, and any excess is carefully removed (Figure 18). The resin is initially polymerized with the curing light through the open facial portion of the matrix; then the matrix is removed and the resin completely polymerized by applying the light from the lingual side (Figure 19).

Once the shell is properly polymerized, the restoration may be built up with the addition of the dentin replacement (Figure 20), any necessary incisal shades (Figure 21), tint characterization (Figure 22), and the overlying enamel replacement resin (Figure 23). Proper establishment of the shell greatly facilitates the placement and proper thickness of these components of the resin restoration. Once the resin additions are established and properly polymerized, the restoration is finished and polished (Figure 24).

SUMMARY

The use of the lingual matrix provides an excellent method to place the Class IV resin composite



Figure 16. Construction of the intraoral lingual matrix.



Figure 17. Preparation with a matrix try-in.



Figure 18. Placement of the lingual shell in the matrix.



Figure 19. Lingual shell polymerized and the matrix removed.



Figure 20. Placement of dentin-opacity resin.



Figure 21. Placement of incisal shade resin.



Figure 22. Placement of white tint modifiers.



Figure 23. Placement of enamel-opacity resin.



Figure 24. Postoperative view of the replacement Class IV restoration.

restoration in a manner that will save time and produce total control of the material. Through the intraoral process of a simple resin addition to the tooth to establish an ideal mock-up in the mouth, this procedure can be used in most restorative situations.

DISCLOSURE

The author does not have any financial interest in the companies whose materials are discussed in this article.

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