FIRST PAGE PROOFS

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Clinical Strategies for Success in Proximoincisal Composite Restorations. Part I: Understanding Color and Composite Selection

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ABSTRACT

The restoration of proximoincisal (Class IV) defects with direct resin-based composites requires attention to many technical and artistic details. This article is the first of a series of two articles that aim at presenting clinical strategies for optimal success when direct resin-based composites are used for the restoration of moderate or large proximoincisal defects. Concepts of natural anatomy, color as it relates to dental structures, and composite selection are discussed in this article and are illustrated with a preclinical exercise and two clinical cases in which these concepts are applied.

CLINICAL SIGNIFICANCE

Success in proximoincisal resin-based composite restorations can be more easily achieved by following the protocol for color and material selection presented in this article. Composite selection involves proper understanding of the optical and physical characteristics of the dentin and enamel layers, which should be closely replicated in the final restoration.

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The direct restoration of proximoincisal (Class IV) defects with composite resin represents a challenge for all clinicians. These restorations require knowledge of the structures and materials involved, attention to detail, and artistic skill. Proximoincisal restorations benefit from the esthetic possibilities offered by modern composite materials, often referred to as “extended-range composites.” The challenges to be faced when executing proximoincisal restorations include the creation of (1) a natural color transition from tooth to restoration, (2) opacification to mask the intraoral background, (3) a translucent incisal edge, and (4) natural surface texture.

To generate unnoticeable restorations the clinician must select, from the available composite materials, those that best mimic the tooth’s optical characteristics once they are fully cured. Such composites have become available thanks to research and developments in the last decade.

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moderate or large proximoincisal defects. In this article, we discuss concepts of natural anatomy, color as it relates to dental structures, and composite selection for the restoration of proximoincisal defects. The companion article (Part II) presents a clinical protocol for insertion, surface characterization, finishing, polishing, and maintenance of moderate or large proximoincisal resin-based composite restorations.

UNDERSTANDING THE COLOR OF TEETH

The natural tooth is polychromatic, that is, a large number of colors and optical characteristics can be perceived when a natural tooth is observed under ideal light conditions. Color is defined in physics as the result of the interaction of light with an object.[1] Different colors result from the multiple ways in which an object interacts with light, absorption and reflection being the most important events for color formation.

Compositional characteristics of a given object have great impact on the way in which light is absorbed by and/or reflected from this object. Enamel, dentin, and pulp, the structural components of teeth, have very different structural characteristics, and these differences greatly influence a tooth's optical properties.[2] Enamel is a prismatic, highly mineralized structure with a low water content. Dentin is an organic, tubular structure with fewer minerals and more water than enamel. The dental pulp is a connective tissue devoid of any mineral phase, but some pulp components extend into the dentinal tubules, making these interdependent substrates. Owing to these and other compositional differences, enamel, dentin, and pulp interact with light differently. Given that these structures are present simultaneously in teeth, except in nonvital teeth, where the pulp is absent, the final result of the interaction of light with a tooth is extremely complex and difficult to reproduce with artificial dental materials.[2]

Color is understood as the combination of hue, value, and chroma.[3,4] *Hue* is defined as the name of a color or the basic color of an object, as in red, yellow, or blue. *Value* is defined as the brightness or luminosity of a color. Finally, *chroma* is defined as the degree of hue saturation or the intensity exhibited by a color.[5] In dentistry, the Vitapan Classic shade guide (Vitalumin, Vita Zahnfabrik, Bad Säckingen, Germany) represents hue by the letters A (perceived as red-brown), B (yellow), C (gray), and D (red-gray); chroma in each hue is represented by A1, A2, A3, and so on; and value from a higher to a lower value is arranged as B1, A1, B2, D2, A2, (. . .), C4. The Vitapan 3D Master shade guide, also by Vita Zahnfabrik, proposes a simplified arrangement of the shade tabs based on the colorimetric classification principle. In this system there is equal distance between the individual levels of value, chroma, and hues, and the tabs are selected in that order.

The esthetic quality of a restoration will be linked to its capacity to simulate the natural visual characteristics of the dental structure regarding enamel and dentin. It is well accepted that the color of a tooth is mainly determined by its dentin component.[6] Dentin has a higher opacity and chroma than enamel. When normally formed, dentin presents a yellow hue that can be influenced by the red and brown hues, resulting in a yellowish-red or yellowish-brown appearance.[7] The value in a tooth is mostly imparted by the enamel, which interferes with the color of dentin, making it less saturated (less chroma). The result of applying a clear and translucent enamel-like material over a saturated and opaque dentin-like material has been described as a "double-effect layer."[6]

A natural tooth looks different as the intensity of light or the observation angle changes.[8] This concept is known as "optical metamerism."[9] In optical metamerism two objects will have the same color under certain light conditions but different colors if the light conditions change. Similarly, two objects with an identical color but a different shape or surface texture will look as if they have different colors. With "geometric metamerism" differences in the objects' format or surface texture produce an apparent difference in the perceived color between two identical colors.[9] An irregular surface will reflect some of the incident light back to the observer, but a large amount of light is also reflected in other directions. Consequently, this irregular surface will apparently be darker than a smooth surface, which reflects most of the incident light back to the observer.[10]

The combination of these different types of light interactions with the tooth structure and its surrounding structures and spaces generates the color perceived by the observer.[8] Owing to the many variables present, some of them discussed above, such as the differences in composition between enamel and dentin, their thickness and age, light conditions, and surface characteristics, it is very difficult, using only one type of composite material, to restore the natural metameric properties of enamel and dentin. Therefore, to properly restore medium or large defects in maxillary anterior teeth, a layering technique using two or more types and colors of composite has to be applied.

The application of the layering technique proposed in this article will involve selecting materials for and restoring dentin and enamel separately in an attempt to respect and restore the optical and physicomechanical characteristics of these substrates. The following sections discuss these characteristics.

RESTORING DENTIN

Hybrid and microhybrid resin-based composites, because of their good physical and mechanical properties, are adequate to restore the dentin stratum of a defect, giving it proper hue, chroma, and opacity. Care must be exercised to consider the possibility of having the chroma changed after polymerization. In addition it has been shown that, in general, composites are grayer and less yellow than teeth.[11] In reconstructing a tooth, dentin-shaded composites occupy the core of the restoration and become the source of hue and chroma.[6,12] The dentin stratum can be divided into opaque and translucent dentin.[13] Composites that have opacity and high chroma are recommended for the inner or opaque layer, whereas composites that are relatively translucent and with high chroma are recommended for the outer or translucent layer.[14] The opaque or inner layer will block light penetration, creating opacity.[13,15] The translucent layer will hold the luminous energy. These two layers favor the fluorescence phenomenon, in which absorption of light of a given wavelength by a fluorescent molecule is followed by the emission of light at longer wavelengths. Fluorescence occurs when an object absorbs nonvisible luminous energy, diffusing it as a visible spectrum.[16] Having absorbed energy, for example, that of sunlight, wavelength amplification and its reflection will occur in a fraction of a second and become visible to the eye. From this phenomenon, light emission from the inner part of the material will occur, creating an esthetic result similar to that offered by a natural dentition.[14]

Owing to their compositional, structural, and functional differences enamel and dentin have completely different behaviors along time in response to external stimuli. Dentin thickness increases because of newly formed dentin within the pulp chamber. This new dentin, which can be either secondary or reactive, increases the opacity and chroma of the tooth.[7] The translucent layer is also altered, becoming opaque with age. As a consequence there will be an increase in the layer of opaque dentin. Thus fluorescence diminishes with age.[14] The result will be a more opaque and yellowish tooth.

During restoration of the internal body of dentin the use of an opaque material that is two chroma points more saturated than the tooth's basic shade is recommended. For example, when the basic shade is A3, A5 or even A6 should be used to attain a subtle internal chroma effect.[2,17,18] The basic shade of a tooth is the median of the existing shades from the cervical to the incisal areas.[19] When restoring a tooth submitted to successful bleaching the basic shade will almost always be close to B1. For such cases the opaque dentin must be very light. Opaque hybrid composites with a high chroma are available from most composite manufacturers. However, there are not many available materials in the market to be used in lighter versions. Table 1 contains examples of composites currently available and specific recommendations for use based on the desired effect and the structure they are replacing in the tooth.

RESTORING ENAMEL

Enamel does not determine a tooth's hue or basic shade but rather its value or brightness. Although the basic shade of a tooth comes from the dentin stratum this color is not fully perceived by the observer because of the enamel layer. Owing to its highly mineralized composition, prismatic structure, and small amount of water and organic matrix, enamel has a high capacity to transmit and/or reflect light, resulting in a light appearance.[20,21] The more an object, in this case a tooth, reflects light, the clearer and more opaque it is perceived by the observer. When the thickness of the enamel layer is increased and that of the dentin is decreased, the

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URRENTLY AVAILABLE AND SPECIFIC RECOMMENDATIONS FOR USE.

	d Effect	Recommended Composite	Example*
	(dark) and opaque dentin	Microhybrid, high chroma, opaque	Charisma OB2, OA3 Opaque composite A4, A5
	Light and opaque dentin	Microhybrid, low chroma, opaque	Opaque composite A1 Charisma SLO Renew Opaque B0.5
Outer (translucent) dentin	Light or dark dentin (not opaque)	Microhybrid	Charisma A2, A3 Charisma B1 for bleached teeth
Enamel body	Whitish and translucid	Microfilled or nanohybrid	Charisma I Filtek Supreme WT Tetric Ceram T Amelogen PF Renew IF
	Yelowish and translucid	Microfilled or nanohybrid	Filtek Supreme WT Amelogen TY
	Grayish and translucid	Microfilled or nanohybrid	Filtek Supreme GT Herculite XRV I med
	Bluish and translucid	Microfilled or nanohybrid	Grayish tone with blue pigment
	Whitish and opaque	Microfilled or nanohybrid	Durafill VS SLO
Surface layer	High brilliance	Microfilled or nanohybrid	Durafill VS
	Proper surface texture	Translucent	Filtek Supreme Simile Neutral color: A1, A2 Bleached enamel: SLO

SLO = super-light opaque.
*Amelogen: Ultradent, South Jordan, UT, USA; Charisma: Heraeus Kulzer, Armonk, NY, USA; Durafill VS: Heraeus Kulzer, Armonk, NY, USA; Filtek Supreme: 3M ESPE, St. Paul, MN, USA; Herculite XRV: Kerr, West Collins, Orange, CA, USA; Simile: Pentron Clinical Technologies, Wallingford, CT, USA; Renew: Bisco, Schaumburg, IL, USA; Tetric Ceram: Ivoclar Vivadent, Amherst, NY, USA.

restoration will become lighter in color. Thus, it is possible to exercise some control over the restoration color simply by altering the thickness of the composite layers used to replace enamel and dentin. This strategy will reduce the number of composite colors needed.

Portions of the incident light penetrate the enamel, reaching the dentin. This part of light that reaches the dentin will then be reflected, revealing its color or hue. When dentin's value is elevated hue and chroma will be less important.[7] Before exiting the enamel this light creates optical effects favored by enamel's prismatic structure. One of these effects is called *enamel opalescence*. The term *opalescence* is originated from the word *opal*, a white and translucent stone that has optical characteristics similar to those of the dental enamel.[22] The opal will look blue under reflected light and yellow-orange with transmitted light, similar to the enamel. This phenomenon is observed particularly in areas of pure enamel, such as the incisal edge and the incisal third of the proximal areas.

The creation of a subsurface layer that is more translucent than the superficial layer tends to maintain the light inside the restoration, providing naturality to the color. This layer has been called iridescent zone, glass zone, proteic zone, or light high-diffusion zone and is reproduced through the use of materials with greater translucency.[6,14] To restore these areas (opalescent and glass zones) incisal or translucent composites can be used in thin layers. It is interesting to note if the enamel layer has a whitish, yellowish, or grayish tone. Some enamel composites can be bluish. A small amount of blue ceramic pigments can be mixed to any of the enamel composites described to create the blue tone desired.[15] The creation of the peripherical opalescent phenomenon and of the central glass zone results in a restoration with a truly three-dimensional, very natural restoration.

From the materials available in the market today, microfilled composites closely simulate the optical characteristics of the enamel surface. Microfills offer high brilliance once they have been polished, with a surface texture similar to that of natural teeth.[18] Notwithstanding the importance of such characteristics on the enamel surface, microfilled composites might not fully reproduce the desired optical effects of the enamel layer. There are brands of microfilled composites that lack translucency, for example. Incisal masses offer great translucency, although their optical properties vary from brand to brand. To better know the color effects of an enamel composite, a customized shade guide can be fabricated.

White hues can be observed within the enamel aligned mesiodistally and are easily observed on dehydration of enamel. Owing to the influence that it has on light reflection, water plays an important role on the final color result. Extracted teeth stored dry are almost always whitish and opaque, with high luminosity. Thus, hydration of enamel takes light deeper into its structure, resulting in less direct reflection of incident light. This also means a reduced opacity and greater chroma because light will reach the dentin. A 10-second dehydration using an air jet will reduce enamel translucency in as much as 82%.[8] Dehydration affects color as a result of water being replaced by air around the enamel prisms. The effect of retrodiffusion in a heterogeneous system, such as that of enamel prisms surrounded by a fluid, is a function of the difference in the refractive indexes of the two components. Dental enamel has a refraction index of approximately 1.7.[11] Given that the refraction index of water is 1.33 and that of air is 1.0, a greater difference and a higher retrodiffusion are produced when the enamel is dry.[8]

COMPOSITE SELECTION

When a layering technique is used, the restorative composites must be selected according to the anatomic structure they will replace. The purpose of this strategy is to select a specific composite that will best respond to the mechanical and optical challenges imposed to that aspect of the restoration. Therefore the following section discusses composite selection for the restoration of (1) the inner dentin layer, (2) the outer dentin layer, (3) the enamel body layer, and (4) the surface layer.

Figure 1. An extracted maxillary central incisor was prepared to demonstrate the incremental composite application technique.

Figure 2. The inner (opaque) dentin layer is restored first with a high-chroma opaque composite (AO3.5) applied to the cervical third of the tooth.

Figure 3. On the middle third, a lower-chroma opaque composite was used (OA1). This layer completes the inner (opaque) dentin layer.

Inner (Opaque) Dentin

The selected material to replace the inner portion of the dentin stratum should be an opaque and highly filled hybrid or microhybrid composite (Figures 1 to 3). These are typically designated "opaque" composites and are identified by the letter "O" associated with their hue and chroma (eg, OA2; see Table 1). In addition to opacity, another goal is to impart strength to the restoration. To increase the opacity effect, that is, when the reference tooth is very opaque, this layer is made thicker. The chroma or saturation, determined by the number associated with the shade's basic hue, chosen is one or two points higher than the tooth basic hue and chroma.[14,15,18] This slightly more chromatic stratum will be "lightened" by the enamel layer, which is typically lighter in chroma. There are situations in which the use of the "C" hue must be considered. As a general recommendation, the following composites can be used for the inner dentin stratum in most restorations: OA5 to OA3 for saturated teeth and OA1 to OB0.5 for bleached teeth.

Outer (Translucent) Dentin

The outer portion of the dentin stratum will require a more translucent composite to allow for some light to enter the dentin. The material of choice is a regular (nonopaque) hybrid or microhybrid composite (Figures 4 and 5). Strength is also important. The general recommendation for this stratum includes shades A3 and A2 for saturated teeth and SL (superlight) and B1 for bleached teeth.

Enamel Body (Translucent)

For this layer, microhybrid composites are preferred, but either a translucent microhybrid composite or a microfilled composite can be used. The denomination "translucent" or "incisal enamel" is typically exhibited on the composite shade denomination. Whitish, grayish, yellowish, and bluish tones are the most predominant tones of enamel (Figures 6 and 7). When different tones must be reproduced, such as blue and/or yellow, they can be obtained by the mixture of tints in the resin mass.[15] Thus, not many tubes of enamel will be needed.

Surface Layer

For the surface layer a microfilled or nanohybrid composite should be used, creating high brilliance

Figure 4. The outer (translucent) dentin layer is built with a translucent composite (A1). This layer is concentrated on the middle and incisal thirds.

Figure 5. The outer (translucent) dentin layer is finalized with the mamelons on the incisal third. It is possible to observe the effect of this layer on the high-chroma internal opaque layer.

Figure 6. The translucent enamel layer is applied using incisal or translucent composites. It is important to observe the enamel tone. In this case, a small amount of a blue ceramic pigment (powder) was mixed to the translucid composite to increase the opalescent effect. On the cervical aspect of the tooth, yellow pigments were used to create a different effect.

Figure 7. Special color effects, such as white lines and high-chroma mamelons, can be created with pigments to improve the final characteristics of the restoration according to the reference tooth or teeth. A thin microfilled composite layer, shade (A1), is then applied on the facial aspect of the restoration.

and proper surface texture (Figures 8 and 9). Within the proposed concept, a thin surface layer will be applied to the restoration. Thus, the final color will not be greatly affected by this layer, and, as a consequence, not many tubes are necessary. The recommendation is for a cervical dark-yellow color (DB), A1 for the majority of cases, and a microfill super-light opaque (SLO) for bleached teeth. Pigments can also be mixed to the resin mass to form this layer to create other tonalities. Shape must have been established by the innermost layers to avoid the need for a thick surface layer. Such a thick layer would prevent obtaining the inner tonality.

RECOMMENDATIONS FOR RESIN-BASED COMPOSITE COLOR SELECTION

- Color selection should first be visualized and registered in the operator's mind based on the visual perception of the natural teeth adjacent to the affected tooth. It is important that the operator becomes familiarized with the composites available. This can be achieved by training, by using custom shade guides, and by the observation and fine-tuning of the results obtained. There is no single composite kit that contains all of the necessary composite shades for all of the clinical situations. The esthetically motivated clinician should identify from the available systems which composites work best and use them interchangeably according to the specific needs of each clinical situation.
- The material in the color tab of the shade guide must be identical to the restorative material to be used. A custom shade guide is recommended. Because composites stain over time, it is recommended that a new shade guide be fabricated every 2 years.
- Choosing the color and selecting the resin should precede the restorative phase, when the tooth is still hydrated. This selection must take into consideration the change of tonality presented by composites because of changes in thickness and polymerization. Thus a quick restorative try-in with the tooth in a hydrated condition is recommended.
- The chromatic chart (a drawing showing the different tonalities seen on the frontal view of the tooth) must identify the basic dentin shade and the translucent regions.[14,19] The use of drawings and drafts for this purpose is helpful, and such records should

Figure 8. Profile view of the finished restoration. It is important to observe the tooth from different angles to respect the tooth form.

Figure 9. Facial aspect of the finished exercise.

be filed with the patient's chart. Photographs and videotapes are also recommended.

- Color-corrected 5,000°K office lights are indicated to produce a constant, not too heavy, light, similar to sunlight.[9] These lights will eliminate any lateral source of reflected light. However, for value selection, a low ambient light is indicated because it enhances the contrast between the structures under evaluation.[22]
- The basic hue of teeth is obtained at the cervical third, where the enamel is thinner and the dentin chroma is greater. In general, hue selection requires A for brown and B for yellow. Close observation of the cervical third of the maxillary canines may help identify the tooth's basic hue (brown, yellow, or gray).
- According to a spectrophotometric study conducted by Yamamoto on the color of natural teeth and the color scales the majority of teeth fit the A hue of the Vita color scale, between A2 and A3.5.[7] Few teeth fit the B, C, and D hues. Thus, if a strong doubt persists regarding the color to be selected, we might elect the A hue and saturations 2 and 3 as universal colors. The double-layer concept, opalescence and glass zone, should be considered.[6]
- We advise observing the dentition from different angles before, during, and after the restoration is completed. This information is useful at the time of planning the macro- and micromorphology of the tooth. Metamerism, or the lack of it, can also be checked by observing the tooth restoration complex from different angles.

The higher the value (lighter) and the lower the chroma of a tooth, the lesser will be the importance of the hue. The value and level of translucency carry more weight than the hue. Conversion charts, such as Ivoclar Vivadent's Chromascope (Ivoclar Vivadent, Liechtenstein), can be used to facilitate this task. For instance, it is difficult to choose between A1 and B1 for a very light tooth. When in doubt the next color dimension to be observed is translucency, leaving hue and chroma for last.[7]

- The natural tooth carries great potential to exhibit metamerism. Color selection requires various kinds of illumination: daylight, artificial light, and obfuscated light. The use of reflected and transmitted light helps us understand the translucency level and the dentin and enamel extension forms between mamelons and on the incisal margin.[14] Then, using ultraviolet light as the only source of light, it is possible to know the degree of fluorescence of the internal part of dentin. Such variations in light will help better capture the proper color.

CASE REPORTS

Two clinical examples are presented to illustrate the potential of the proposed technique. (The companion article in this series presents the restorative technique in detail.) In the first case (Figures 10 to 25), a 10-year-old boy, following trauma

Figure 10. Facial intraoral view of a 10-year-old patient after trauma and uncomplicated crown fracture on the maxillary right central incisor (FDI no. 11). Vitality tests were positive. In preparation for the restorative appointment, the tooth's value, translucency level, inner dentin design, and other characteristics must be recorded at this visit while the tooth is hydrated.

Figure 11. A periapical radiograph reveals no root fracture and open apex.

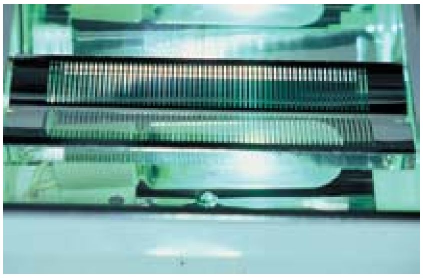

Figure 12. Color-corrected light is used for color selection.

Figure 13. A try-in restoration is completed to confirm the selection of the composite pastes necessary to create an imperceptible (or barely perceptible) restoration.

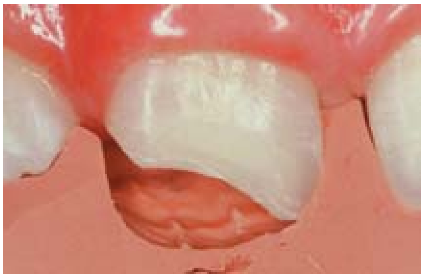

Figure 14. A silicone matrix is generated. After removal of the try-in restoration, the restorative space can be observed.

and fracture of the maxillary right central incisor, presented for a restorative session (see Figure 10). A periapical radiograph revealed the root formative stage (see Figure 11). A corrective 5,000 K lamp was used for color selection (see Figure 12). After this step, the lamp was turned off to avoid visual fatigue.[9]

Color and Format Selection by Means of a Restorative Try-in

The restorative try-in is a preliminary step to the definitive restoration and is also known as a mock-up restoration. It makes it possible to test various tonalities and opacities on the tooth, determining the thickness and sites to be used for the final restoration. Light-cured composite resins offer unique possibilities to create a restorative prototype. No adhesive procedure is carried out prior to the restorative try-in; the tooth, however, must have been prepared. The influence of the composite's thickness must be observed because composites keep their original color only in 1.5 to 2.0 mm–thick increments.[13,23] Thinner increments will have their tonality influenced by the background color or by the surrounding structures. Additional advantages of a restorative try-in are to obtain the lingual, proximal, and incisal contours to be copied by a silicone matrix; patient communication; and to perform the informal restoration of the tooth during the first visit (try-in), correcting eventual imperfections during a second visit (definitive). The mock-up restoration for the case presented is exhibited in Figure 13. The mock-up was molded with a putty polyvinylsiloxane-based impression

Figure 15. Incisal view of the fractured tooth. A retraction cord has been placed for isolation. The lingual margin of the fracture is slightly subgingival.

Figure 16. The first composite increment is applied to the tooth, corresponding to the inner (opaque) dentin layer. Observe the difference in translucency between the tooth and the composite.

Figure 17. Silicone spatulas and brushes are used to model the composite to the restorative site. These instruments can be lightly lubricated in fluid resin.

Figure 18. A thin layer of an opaque microfill composite is applied to the inner dentin layer and the tooth to lessen the difference in translucency between these two areas. This layer will help eliminate the dark line that is commonly observed in proximoincisal restorations.

Figure 19. The composite corresponding to the translucent enamel is applied between the dentin mamelons, in the incisoproximal areas, and at the facial aspect of the restoration.

Figure 20. The silicone matrix is used to confirm the form and orientation of the restoration.

material (Express, 3M ESPE, St. Paul, MN, USA). The guide was cut very close to the incisal edge. After displacement of the mock-up restoration, the matrix is seated, and the restorative space can be seen in Figure 14.

Restorative Procedure

To obtain a tooth-resin transition area with a smoother appearance, a 1.5 mm bevel was placed at the margins of the fracture. Isolation was obtained with cotton rolls and a retraction cord (see Figure 15). After a 30-second phosphoric acid etching, a 15-second rinse, and blot-drying of the etched preparation, two consecutive coats of the Single Bond adhesive system were applied (3M ESPE) and light cured. Care must be taken to etch and bond the tooth structure beyond the bevel margins to enable a slight composite overcontour in this area. The first composite increment corresponds to the inner opaque dentin portion. This layer is built up using metallic spatulas, brushes, and silicone spatulas, which render the modeling of composite easier (see Figures 16 and 17). The opaque dentin layer, which in this case is not too large owing to the restoration size, is covered with a thin layer of translucent dentin. The dentin incisal design, shaped as mamelons, must also be reproduced according to the map previously devised for this case using tooth ~~no. 9 (FDI no. 21~~) as a reference.

AUTHOR: Dr. Heymann changing numbers to description "maxilllary left central incisor"

Figure 21. Some optical characteristics of the restoration can be better observed prior to the finishing or polishing step owing to less light reflection. Light reflection will mask the color of the restoration.

Figure 22. Facial view of the restoration as seen in Figure 21 after polishing.

Figure 23. Facial view of the restoration with the lips in a relaxed position. Observe the translucency obtained on the restoration.

Figure 24. Frontal view of the maxillary anterior teeth. Compare the shade and translucency of the restored tooth with those of the natural teeth.

Figure 25. Final postoperative result after 15 days.

Figure 26. Facial view of an unesthetic resin-based composite present at the distoincisal aspect of a maxillary right central incisor (FDI no. 11). As in the previous case, in preparation for the restorative appointment, the tooth's value, translucency level, inner dentin design, and other characteristics must be recorded at this visit while the tooth is hydrated.

Where dentin and bevel join, a thin layer of a more opaque resin, of similar saturation and hue, can be applied to make this resin-tooth interface less noticeable (eg, Durafill OB2, Heraeus Kulzer, Armonk, NY, USA). This resin is layered as a band along the resin-tooth junction (see Figure 18). Applying a highly translucent resin to the enamel will help the optical phenomena of opalescence and gray-blue incisal edge (see Figure 19). At this time the inclination and length of the restoration can be checked using the silicone matrix (see Figure 20). Figure 21 depicts the restoration before polishing procedures were conducted. Several postoperative photographs were taken for final observation of the results (see Figures 22 to 25).

In the second case (Figures 26 to 30) an unesthetic proximoincisal resin-based composite was replaced in a maxillary right central incisor using the described restorative method.

CONCLUSIONS

Although challenging, proximo-incisal resin-based composite restorations can be predictably and successfully accomplished by following the protocol for material selection presented in this article and the restorative technique presented in a companion article. Composite selection involves proper understanding of the optical and physical characteristics of the dentin and enamel layers, which should be closely replicated in the final restoration.

DISCLOSURE

The authors do not have any financial interest in the companies

Figure 27. A mock-up restoration is created with the selected composites, and a silicone-based custom matrix is created to aid in the placement of the permanent restoration.

Figure 28. Intraoral view of the tooth preparation with the custom matrix in position.

Figure 29. Intraoral view immediately after the lingual enamel layer has been light- cured and the custom matrix removed.

Figure 30. Final restoration.

whose materials are discussed in this article.

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