

The Direct/Indirect Composite Resin Veneers: A Case Report

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Veneer restorations are well suited for conservative and aesthetic improvement of the anterior dentition. Laboratory fabricated porcelain and composite resin veneers present optimal aesthetics and durability. Although there are disadvantages associated with direct bonding, it provides control of color and contour for the operator, particularly in the case of a single anterior central incisor. Direct/indirect composite resin veneers utilize the advantages of both direct and indirect techniques in reconstruction of restorations with improved physical properties. The learning objective of this article is to review the available composite resins, opaquers, and tints, and present a step-by-step protocol for predictable restoration of discolored anterior dentition with direct/indirect heat-treated composite resin veneers in a single appointment. Patient evaluation, pre-operative aesthetic considerations, selection of the restorative composite resins, and the clinical procedure are discussed.

The advent of light-cured composite resin materials and the ongoing advancement of adhesive technology have generated the development of several conservative aesthetic techniques for correction of a variety of generalized color defects. These defects include tetracycline stains, fluorosis, hypoplasia, hypocalcification, aging, pulpal necrosis, and morphologic defects due to caries, trauma, and genetic factors.^{1,5} Among the clinical procedures employed is the use of composite resin as a direct veneering material, as well as indirectly-fabricated laboratory-processed laminate veneers.

In the direct veneering technique, composite resin is applied directly to tooth structure and artistically sculpted to correct color and contour defects.⁴ Direct veneers allow the operator to control and evaluate the restorative process

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Figure 1. Preoperative view of discolored maxillary left central incisor and Class IV defects of both maxillary central incisors in an 18-year-old patient.

from shade selection to final morphology,⁶ and the placement is generally accomplished in a single appointment. This efficacy has established direct resin restorations as the most commonly utilized form of veneering.

Direct composite resin veneers, however, possess disadvantages inherent in the material, including color instability, excessive wear, and polymerization shrinkage,⁷ which may result in an estimated longevity of the restoration of 4 to 8 years.⁸ Successful aesthetic and functional results are dependent primarily on the operator's understanding of adhesive technology and the components of color, including their relationship to natural tooth structure and composite resin restorative materials.⁹

To address the challenges presented by the direct composite resin veneers, indirect composite resin veneer systems have been developed, which allow the restorations to be processed in the laboratory or chairside. When subjected to heat, in combination with increased exposure to visible-spectrum light, vacuum, or pressure, these types of restorations exhibit greater conversion of the resin through increased polymerization. This conversion may result in the improvement of the material's physical properties, such as wear-resistance, hardness, elimination of shrinkage, color stability, and biocompatibility.¹⁰⁻¹⁴

The direct/indirect composite resin veneer technique comprises advantages

of both techniques, and can be performed in one appointment. The absence of the laboratory phase precludes provisionalization and eliminates laboratory fees. In addition, it allows the operator greater control over tooth anatomy and color. This is particularly evident in the restoration of a single anterior central incisor.^{3,7} As a prerequisite, however, the clinician must maintain a broad comprehension of the concepts of hue, chroma, value, translucency, and opacity,¹⁵ their relationship to the histologic characteristics of sound natural tooth structure, and their correlation with the optical and physical properties of the composite resin restorative materials. The artistic manipulation of composite resins that evolves an amorphous mass into a restoration of natural appearance demands time and intensive training. Replication of natural dentition should be faced as a challenge that contributes to professional growth rather than as a frustrating experience.

Since the direct/indirect composite resin veneer is sculpted directly onto the tooth surface and removed, it can be heat-treated and further finished and polished prior to being processed for bonding and cementation. Therefore, improved physical properties, excellent aesthetics, marginal adaptation, and integrity of the restoration can be achieved. One of the most significant advantages of this technique is the ability to effect color changes in the restoration with the aid of luting cements, allowing slight modifications in hue, chroma, and value.¹⁶ Moreover, marginal gap formation due to polymerization shrinkage of the restorative resin is compensated by the precise fit of the directly sculpted veneer in association with a low film thickness of the luting resin cement.¹⁷

Due to the numerous advantages of the state-of-the-art light-cured microfill, hybrid, and opaquing composite resins, veneer restorations fabricated from these materials have minimal thickness, improved color stability,¹⁸ high polishability, and improved marginal adaptation. These veneers will maintain surface texturization and correct anatomic form for longer periods of time than veneers fabricated from the early composite resins.¹⁹

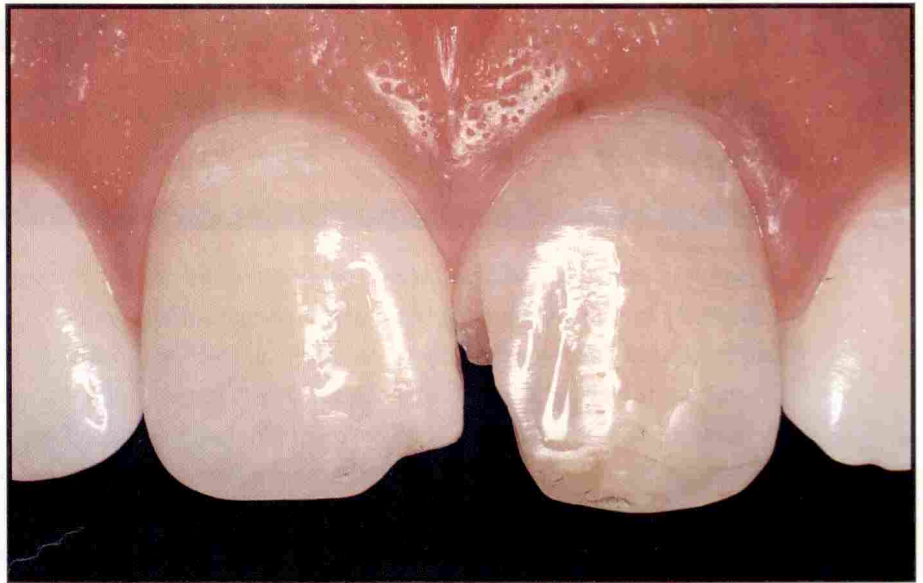


Figure 2. Close-up view of compromised aesthetics and disrupted dominance of the central incisors, due to the Class IV defects and discoloration.

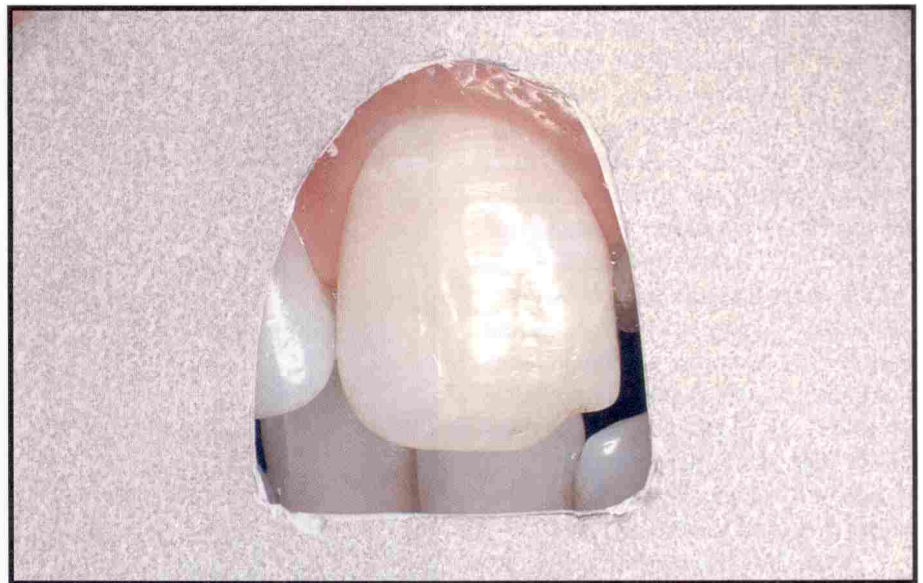


Figure 3. Facial view of the "blinder" on a maxillary central incisor used in the shade selection process.

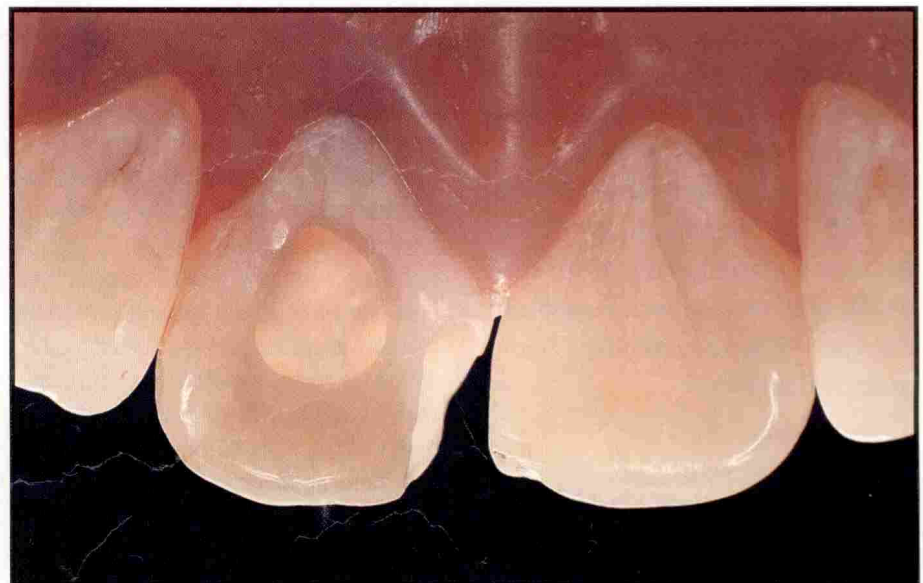


Figure 4. Palatal view of the maxillary central incisors following tooth preparation. The discolored left incisor exhibits an ample pulp chamber.

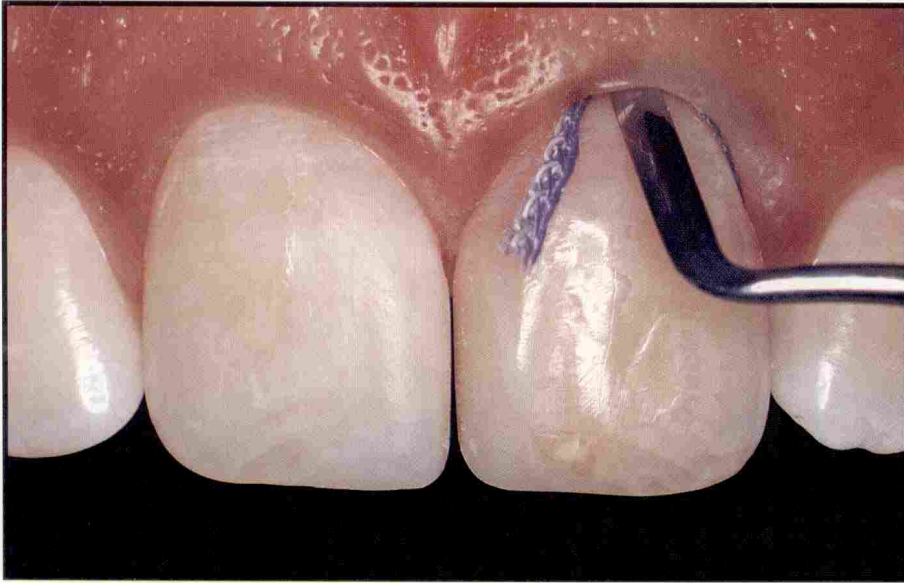


Figure 5. Retraction cord was packed to protect and retract the gingival margin during tooth preparation.

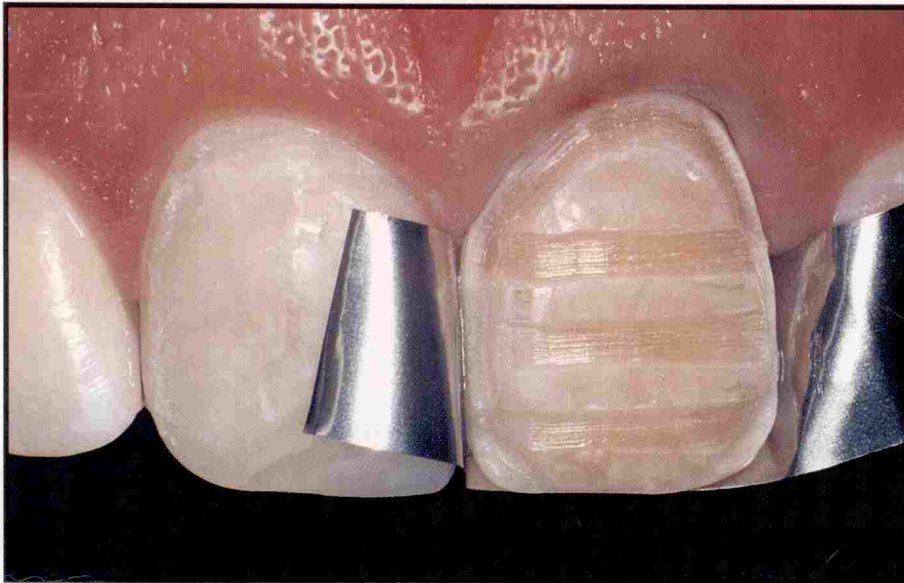


Figure 6. Labial depth-cuts and interproximal gingival chamfers were placed to guide the initial tooth reduction.



Figure 7. The preparation was completed, polished, and an isolating medium was applied to prevent the veneer from adhering to the tooth.

The stained dentition is an aesthetic challenge. Severe stains, such as those produced by tetracycline therapy or the gray-black appearance of a nonvital tooth, have been particularly difficult to mask effectively with composite resins. This article presents a step-by-step clinical sequence for restoring a nonvital, endodontically treated, and discolored maxillary central incisor with the direct/indirect composite resin veneer technique.

INITIAL PATIENT EVALUATION

An 18-year-old male patient presented with Class IV defects of both maxillary central incisors (Figure 1). The left central incisor had been endodontically treated and exhibited severe discoloration (Figure 2). Medical/dental history was obtained, and initial radiographic and clinical examination of the fracture site was performed. The fractures and the discoloration disrupted the dominance²⁰ of the central incisors and the harmony of the smile.²¹⁻²³ Home and practice-assisted bleaching²⁴ was suggested to improve the overall appearance of the dentition and lighten the left central incisor, but the suggestion was declined. A thorough visual assessment was performed to evaluate the occlusion, the morphologic, histologic, and optical characteristics, as well as the polychromy of the sound adjacent teeth.

PREOPERATIVE AESTHETIC CONSIDERATIONS

Shade Selection

Shade was selected prior to isolation of the teeth to eliminate shading variations that can occur as a consequence of dehydration of the teeth, which results in an elevated value (lighter hue). Prior to shade selection, the teeth were cleaned with a prophyl cup and a slurry of pumice with 4% chlorhexidine. Since the maxillary left central incisor was discolored, the right incisor was used as a reference. A "blinder" (a device consisting of a small piece of neutral gray cardboard with a cut-out in its center of approximately the size and shape of a maxillary central incisor) was held against the patient's dentition with the incisor visible through the cut-out portion in order to eliminate any color interference from its surroundings (Figure 3).²⁵

A shade guide (Vita, Vident, Baldwin Park, CA), rearranged according to the value and divided into three thirds by imaginary lines, was used, and the third closest in value to the right central incisor was selected with the aid of a color-corrected shade selection light (Esthelite, Efos, Williamsville, NY). The dominant hue and chroma were selected for each of the horizontal and vertical thirds of the tooth and correlated with the restorative composite resins.²⁶ Shade variations, as well as hypoplastic and intrinsic polychromatic spots (maverick colors) were observed and charted accordingly in a schematic drawing to be used as a reference for the restorative sequence.

SELECTION OF THE RESTORATIVE COMPOSITE RESINS

In cases of severely discolored teeth, translucent microfilled composites, as well as high-value opaque and translucent hybrid composites should be selected to compose the body of the restoration.

Selection of the Opaque Hybrid Composite Resin

The opaque hybrid composite is the first layer of restorative material that comes in contact with the tooth surface. It is selected to provide a highly filled resin substrate that can be sandblasted to improve adhesive capabilities, and to raise the value, thereby masking the darkness of the underlying tooth substrate. Surface treatment of composites for indirect bonding has been reported to be optimal when sandblasting with aluminum oxide, followed by silanization.²⁷ Therefore, in order to provide maximum bond strengths, the entire prepared tooth surface must be covered with this layer of hybrid composite.

Generally, it is easier to lower the value than it is to elevate it, while still maintaining the natural appearance of a composite resin restoration. Consequently, the higher the value of the first hybrid composite layer, the more opportunities the operator has to compensate for it by lowering the value while using low-value tints and restorative resins. From among the available opaque hybrid and microhybrid resins, the author utilizes particular opaque resins to achieve aesthetic results (Herculite XRV Dentin Shades, Kerr, Orange, CA; P50, 3M, St. Paul, MN).

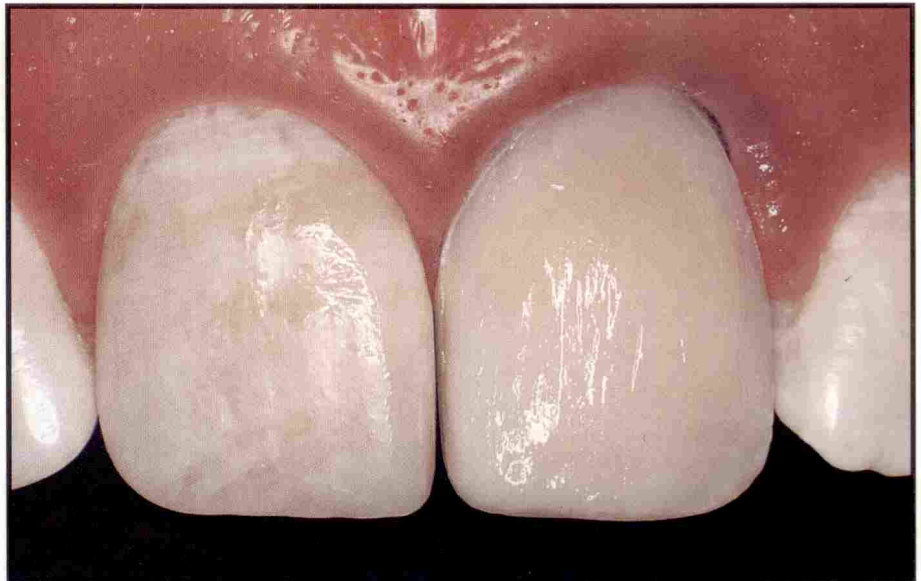


Figure 8. A high-value opaque hybrid resin layer was applied and sculpted to achieve a minimum thickness.



Figure 9. The opaquer layer was applied with artist brushes to match the desired value.



Figure 10. A translucent hybrid resin was applied over the opaquer layer to impart a natural light-penetrating appearance to the veneer.

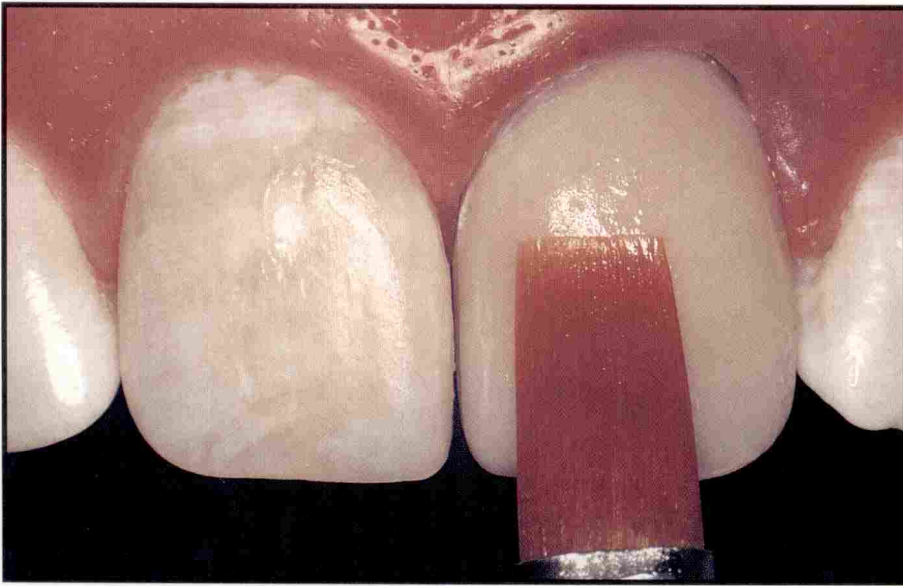


Figure 11. Artist brushes of varying shapes were used to finesse surface irregularities.



Figure 12. Tints and opaquer were used sparingly to replicate polychromy of the adjacent central incisor.



Figure 13. A translucent microfill composite resin was applied as the final layer to achieve an enamel-like translucency.

Selection of Opaquers and Tints

Opaquers may determine the final aesthetics of a veneer, especially in cases of severely discolored dentition. Their primary function is to neutralize (or elevate) the low value of selected areas of the tooth. If the opaquer is underapplied, the darkness of the substrate will be visible through the layer, and a low-value unpleasantly dark veneer will result. When used under the translucent hybrid composite resin, opaquers should be of the same hue and chroma as the final microfilled layer. Therefore, when selecting opaquers, it is important to select one that has a wide range of shades and is keyed to the Vita shades for ease in color matching (eg, Creative Color, Cosmedent, Chicago, IL; Kolor+ Plus/ Opaquer, Kerr, Orange, CA; Durafill Color VS, Kulzer, Irvine, CA). Tints are low viscosity, intensely colored resins that are used to characterize or "chromatize" a restoration. Blue, violet, and gray tints can be used to simulate translucency. Ochre, orange, or honey-yellow may be used to raise the chroma of the cervical third of the restoration. Brown, in association with a mix of orange and A1 opaquer, can be used to replicate craze lines. There is an infinite number of applications for tints and opaquers to impart all the polychromy required to render a restoration as natural as possible, and the reader is advised to utilize up-to-date informational sources for comprehensive understanding of these materials and their usage. It is important to remember that opaquers and tints should always be used sparingly and carefully; inappropriate use can make a restoration appear worse than no use at all. It is equally important to note that tints and opaquers should be used for intrinsic staining and opaquing and must always be overlaid with a microfill or hybrid resin.

Selection of the Translucent Hybrid Composite Resin

The translucent hybrid (or microhybrid) composite is the body of the restoration and imparts fracture resistance to the veneer (eg, Herculite XRV & Prodigy, Kerr, Orange, CA; Renamel Hybrid, Cosmedent, Chicago, IL; Charisma, Kulzer, Irvine, CA; Z100, 3M, St. Paul, MN). It must follow the same shading pattern (hue and chroma variations) as

the microfill composite along the facial aspect of the tooth, and it must cover the veneer preparation completely.

Selection of the Microfill Composite Resin

The microfill composite resin overlays the entire restoration, imparting a high lustrous glow, and the selection of this material must be accomplished first. A small increment (no more than 2 mm thick) of a translucent microfill composite (eg, Durafill VS, Kulzer, Irvine, CA; Renamel Microfill, Cosmedent, Chicago, IL; Amelogen Microfill, Ultradent, South Jordan, UT), with hue and chroma in direct harmony with those characteristics in the tooth, is placed onto the middle third, polymerized, and evaluated for its shade-matching properties. If a chroma or opacity variation is perceived cervicoincisally, the same process must be repeated for each specific third or other more compartmentalized area of the tooth. For accentuated chroma and opacity at the cervical third, opaque microfill resins should be used (Silux Plus Opaque, 3M, St. Paul, MN; Heliomar, Vivadent, Amherst, NY). If intense translucency is desired, especially in the incisal third, an incisal shade of a microfilled composite should also be selected (eg, Renamel Microfill Light and Medium Incisal, Cosmedent, Chicago, IL).

CLINICAL PROCEDURE

- The defective composite restoration of the palatal aspect of the maxillary left central incisor was removed with a long, tapered, coarse diamond bur (#0850-014, Brasseler, Savannah, GA). Any secondary carious lesions and necrotic material were removed with round burs at low speed. The root canal obturating material was removed approximately 3 mm apical to the cemento-enamel junction (CEJ) (Figure 4).
- Isolation was accomplished by means of a cheek and lip retractor (Expander, Parkell, Farmingdale, NY), bilaterally placed cotton rolls, and 2x2 gauze.
- A slurry of pumice and 4% chlorhexidine was used in a prophy cup to clean the external aspects of the central incisors, and a premixed slurry



Figure 14. The veneer was sculpted to its correct morphology.

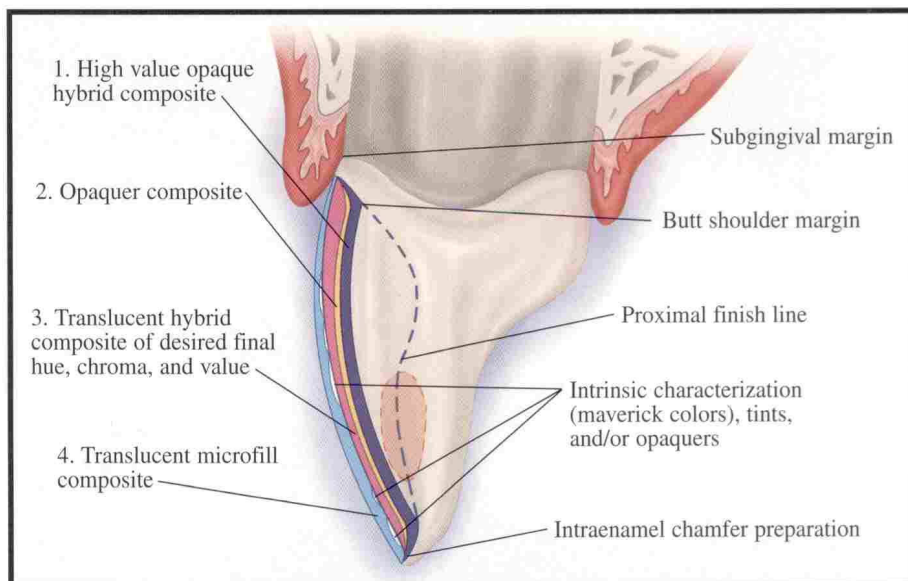


Figure 15. Diagram of the restorative resin layering sequence to be followed to achieve optimal opaquing and aesthetic results.

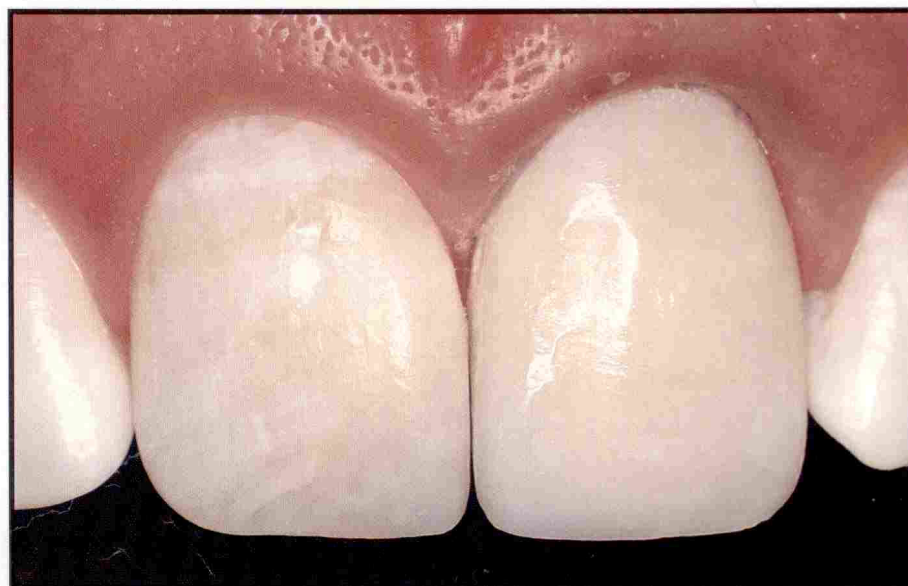


Figure 16. Finishing and polishing was accomplished prior to veneer removal.



Figure 17. A thin-edged instrument was carefully introduced at the tooth/veneer interface to “tease” the resin pattern off the prepared tooth.

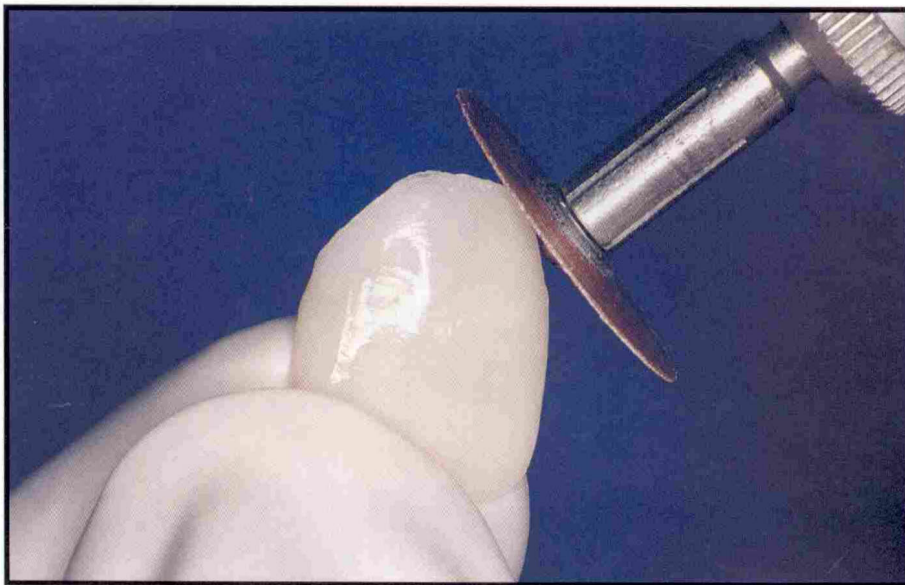


Figure 18. The veneer was further finished, polished, and heat-treated to improve its physical properties.

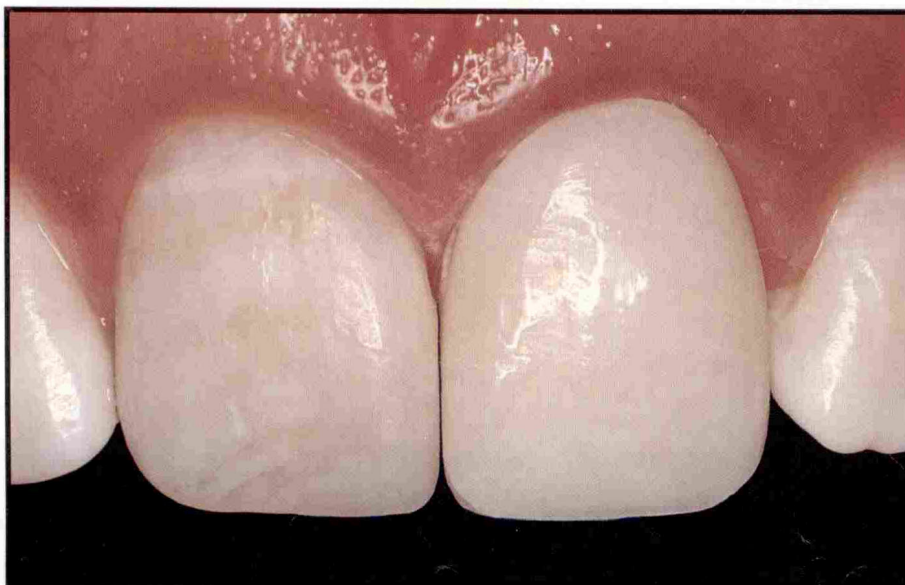


Figure 19. The veneer was placed dry on the tooth for initial color assessment, and it exhibited an elevated value.

of 2% chlorhexidine (Consepsis Scrub, Ultradent, South Jordan, UT) was used to clean inside the root canal and pulp chamber. The teeth were thoroughly rinsed for 30 seconds and dried with compressed air.

- Since the central incisors presented morphologic asymmetry, enameloplasty was performed on the mesial aspect of the right incisor in order to establish the correct width of the anatomic crown of both teeth and also to determine the midline.
- All dentin and enamel surfaces were treated with a 35% phosphoric acid etching gel (Ultraetch, Ultradent, South Jordan, UT) for approximately 15 seconds, and a dentin-enamel adhesive was applied as per manufacturer’s instructions (Optibond FL, Kerr, Orange, CA). Class IV defects of both central incisors and the palatal cavity of the left incisor were restored with a combination of hybrid and microfill resins (Clearfil AP-X, J. Morita, Tustin, CA; Durafill VS, Kulzer, Irvine, CA), finished, and polished.
- Tooth preparation should provide adequate space for the translucent composite resin materials and the opaque hybrid and opaquer resins. It must also provide a smooth, polished surface to facilitate the displacement of the veneer after curing. The labial preparation should reduce an adequate amount of tooth structure to facilitate the placement of an aesthetic restoration. Depending on the severity of the tooth discoloration, additional reduction of facial enamel may be required, even though dentin may be exposed, to generate adequate space for the restorative resins. If insufficient tooth structure is removed, thicker layers of opaquers and opaque resins have to be employed to mask the underlying discoloration, resulting in a lifeless, artificial restoration.
- Prior to tooth preparation, retraction cord (Ultra-Pack #0, Ultradent, South Jordan, UT) was placed to retract the facial gingival margin approximately 0.5 mm apically and protect the tissue from scarring during preparation (Figure 5).

- A dead-soft metal matrix strip (Den-Mat, Santa Maria, CA) was placed interproximally, mesially, and distally to provide improved visualization of the preparation area and prevent injury to the adjacent teeth.
- Tooth preparation was performed as if for a porcelain veneer, with a veneer preparation system (Laminate Veneer System, Brasseler, Savannah, GA). To avoid random reduction of the facial tooth structure, a depth cutter contained in the system was used to determine the initial preparation depth — 0.5 mm. The utilization of a depth guide should be regarded only as a starting point. After facial reduction is completed, the degree of discoloration must be evaluated to determine whether additional reduction of tooth structure is required to provide additional space for the restorative materials.
- A chamfer finish line, which should be within enamel whenever possible to ensure an adequate seal of the veneer, was placed into the interproximal embrasures without breaking contact and confined in enamel along the incisal edge. This preparation is designed to protect the resin veneer, preventing it from chipping during excursive movements of the mandible or mastication. If lengthening or anatomic modification of the incisal edge is desired, the preparation should extend over the incisal edge at least 2 mm onto the palatal aspect. The cervical chamfer was placed, following the free gingival margin from papilla tip to papilla tip (Figure 6).
- To finalize initial facial reduction, the enamel and restored Class IV defect were reduced to the depth of the initial guide cuts with a two-grit diamond (Laminate Veneer System, Brasseler, Savannah, GA). Due to the intensity of the discoloration presented by the remaining tooth structure, tooth removal (approximately 0.2 mm) was continued until sufficient space was created, as viewed from an incisal angle. The cervical chamfer was modified into a butt

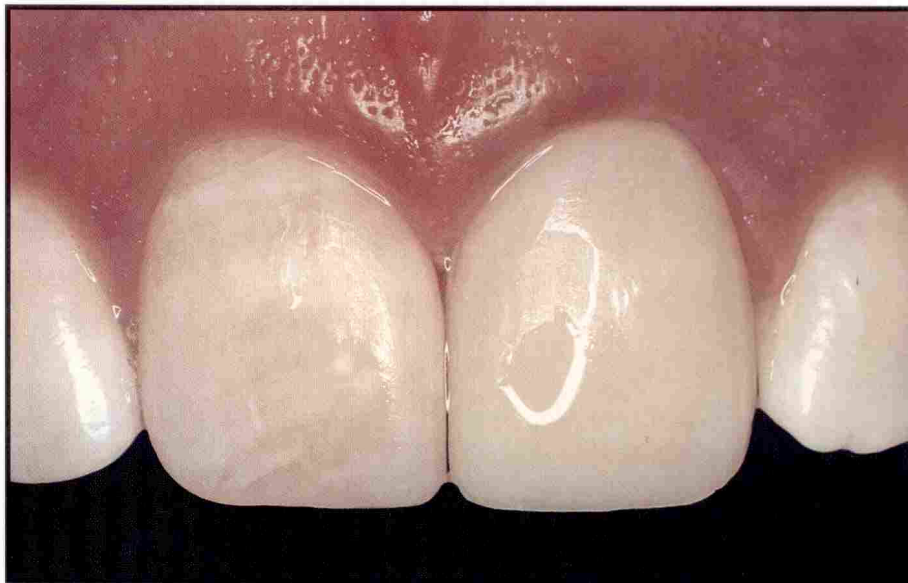


Figure 20. Water was used as a clear optical medium to capture the shade of the underlying tooth structure to determine value changes to be achieved with the luting resin.

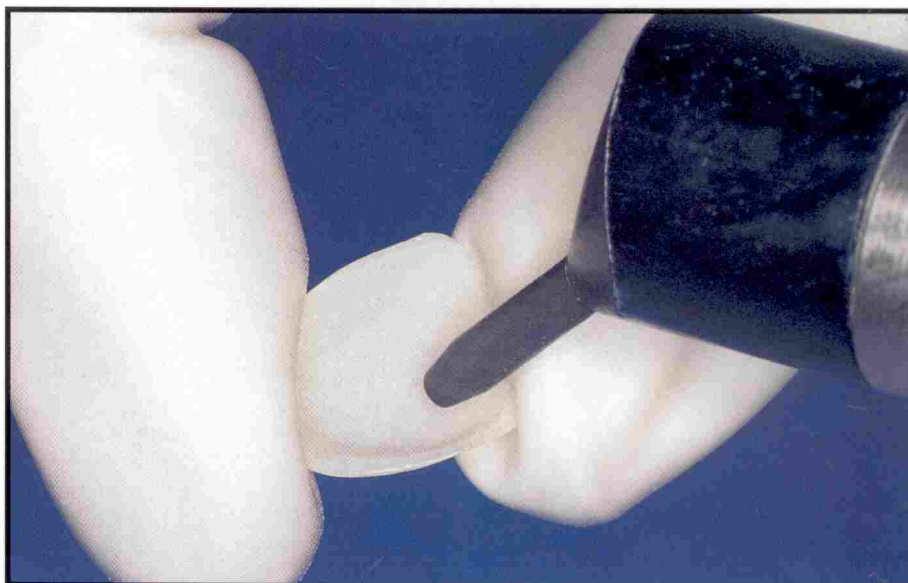


Figure 21. The inner surface of the veneer was sandblasted to increase bond strength.

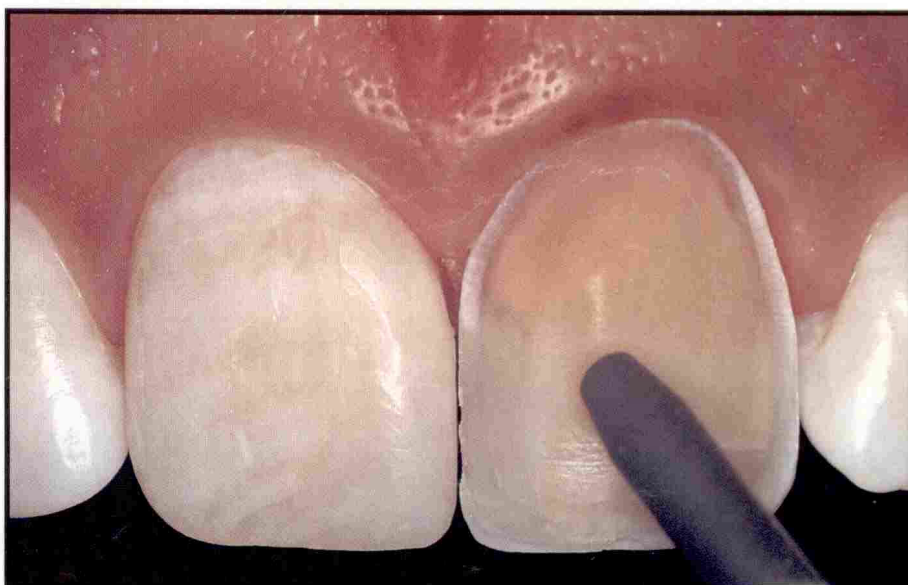


Figure 22. The prepared tooth surface was also sandblasted.

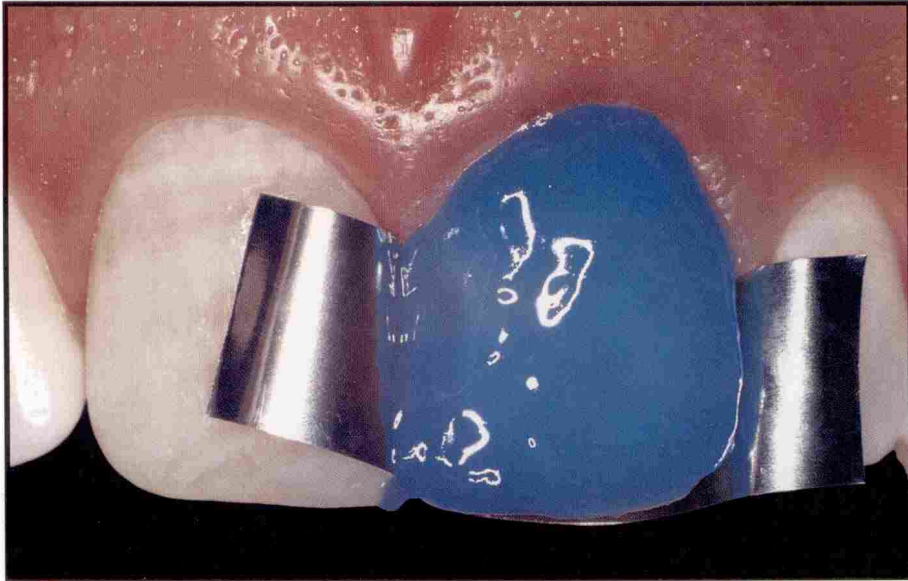


Figure 23. Enamel, dentin, and composite were etched with 35% phosphoric acid.

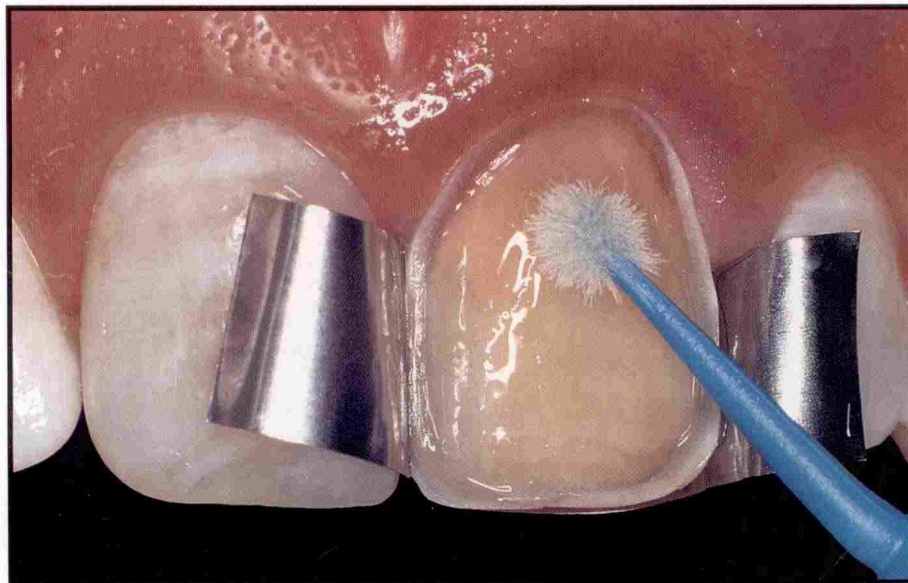


Figure 24. A dentin/enamel bonding agent was applied over the preparation.

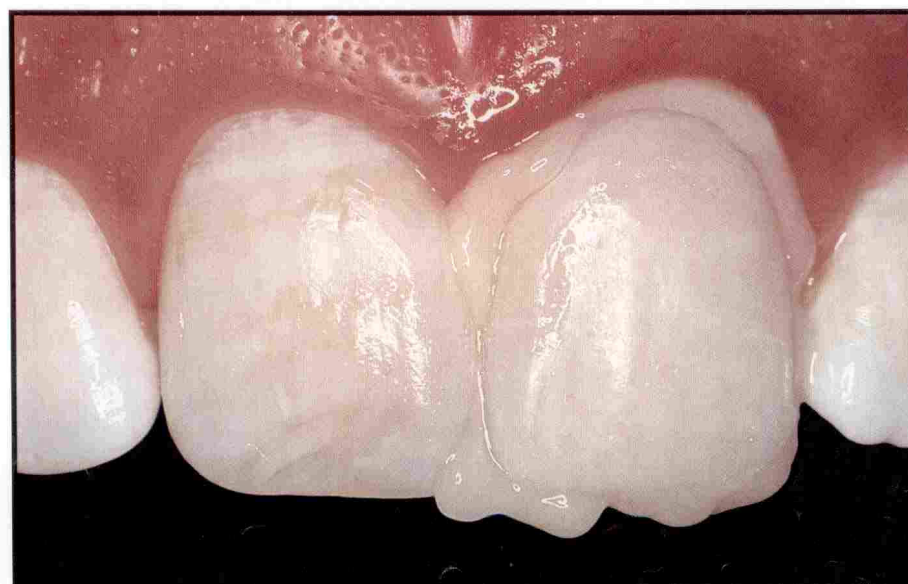


Figure 25. A resin cement of the desired hue, chroma, value, translucency, and opacity was used to lute the veneer into place.

shoulder to provide more thickness to the restorative material at the gingival margin, which presented the most severe discoloration.

- The entire preparation was further finished with aluminum oxide discs (Sof-Lex Pop-On XT, 3M, St. Paul, MN) and polished with rubber cups (FlexiCups, Cosmedent, Chicago, IL). This step is especially important to prevent adherence of existing composite restorations in the prepared tooth to the resin veneer that will be built up over it (Figure 7).
- The prepared tooth was cleaned in a rubbing motion with a cotton pellet moistened with 4% chlorhexidine. Prophy cups are not recommended for cleaning at this stage, as they might provoke bleeding of the gingiva.
- Solid petroleum jelly was painted onto the tooth and adjacent unprepared teeth, and all excess was removed with dry gauze. A water-soluble separating medium can also be used for lubricating the prepared tooth.
- A single increment of an opaque hybrid composite (Herculite XRV B1, Kerr, Orange, CA) was applied with the nonadherent spoon-shaped end of a golden composite instrument (Almore, Portland, OR) and sculpted to encompass the entire preparation. This first layer of composite must invariably be applied in a single increment to avoid contamination of the resin with the lubricant. The following layers can be applied in smaller stratified increments, as needed. To prevent overbuilding the first layer, which would compromise the final aesthetic result, contouring of the composite resin was constantly monitored from the incisal aspect through indirect vision.
- The layer of opaque hybrid resin was sculpted with the composite instrument, and several artist brushes (#400, Ref.1714, Takanishi, Renfert, Hilzingen, Germany; #1, #2 fine-tipped, and #3 flat-tipped, Cosmedent,

Chicago, IL) were used to contour, smooth, and adapt the resin to the preparation finish line (Figure 8).

- The opaque hybrid resin layer was polymerized with a curing unit (Optilux 500, Demetron/Kerr, Danbury, CT), using a 13 mm tip for only 10 seconds to harden the restorative material. This technique allows placement of subsequent increments without deforming the underlying composite layer.
- An opaquer resin (Creative Color A3, A3.5, Cosmedent, Chicago, IL) was applied with an artist brush to elevate the value of the restoration to resemble that of the right central incisor. Concomitantly, a close approximation of the hue and chroma was also achieved. It should be noted that opaquers must be applied sparingly, in thin multiple layers, until the desired masking effect is obtained without imparting a nonvital appearance to the restoration (Figure 9). This layer was polymerized for 40 seconds.
- A single increment of a translucent hybrid resin (Clearfil AP-X A3, J. Morita, Tustin, CA) was applied over the entire underlying restoration and contoured with composite instruments (Figure 10). Since the translucent hybrid resin imparts most of the final desired hue, chroma, and value (to a lesser extent), it becomes imperative that this layer be manipulated to an almost final morphology, yet allowing sufficient space for the placement of the final microfill resin.
- Artist brushes were used to smooth the resin surface (Figure 11). This step is particularly important, since irregularities on the resin surface do not allow complete control over the application of tints and opaquers, resulting in pooling of the material. The translucent hybrid resin layer was polymerized for 10 seconds.
- To mimic hypoplastic spots and higher chroma areas along the tooth crown, white and ochre tints

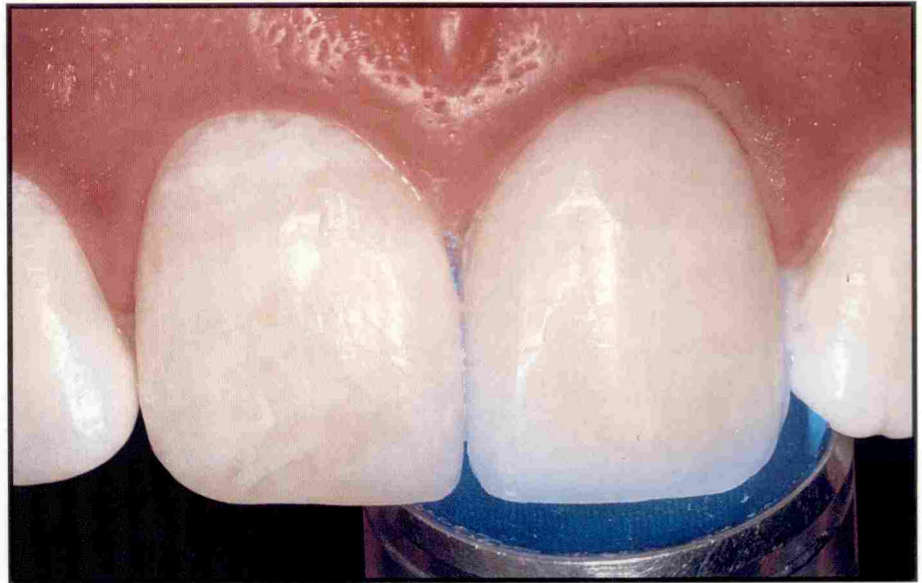


Figure 26. The veneer was light-cured from the palatal and labial aspects, and final finishing and polishing was performed.

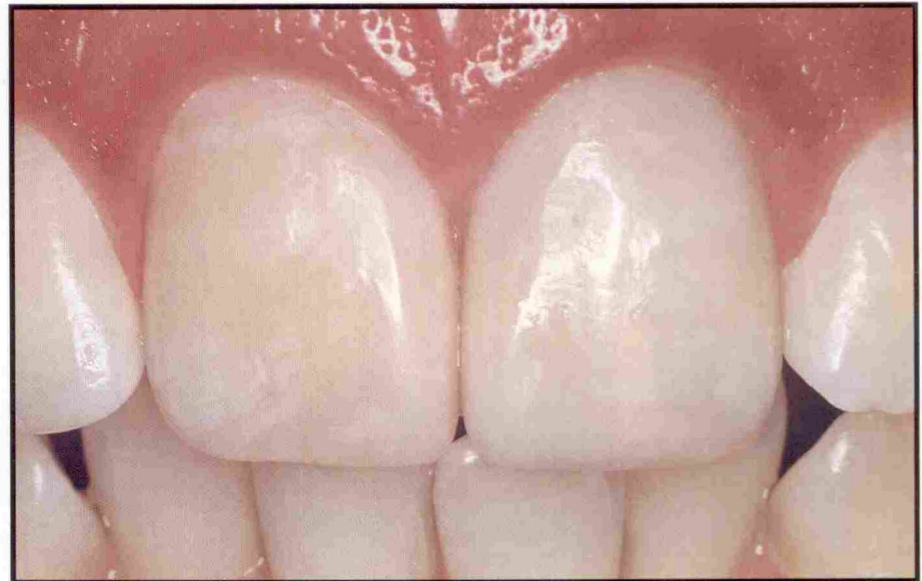


Figure 27. Facial view of the direct/indirect composite resin veneer one week postoperatively. Note presence of healthy gingival tissue.



Figure 28. Postoperative facial view of the functionally and aesthetically restored maxillary central incisor with the direct/indirect composite resin veneer technique.

(Kolor+ Plus, Kerr, Orange, CA) were sparingly applied to match the same pattern presented by the right central incisor and polymerized (Figure 12).

- An incisal translucent microfill resin (Renamel Microfill light incisal, Cosmedent, Chicago, IL) was applied to completely cover the underlying resin layers (Figure 13). This last layer of composite resin must be slightly overcontoured, to allow some material reduction during the finishing and polishing process (Figure 14). This more translucent microfill permits the intrinsic characterization to glow through, while elevating the value of the restoration to match that of the right central incisor. The labial microfill resin was light cured for 60 seconds.
- Fundamental principles of tooth preparation, appositional layerings of translucent and opaque composite resins, opaquers, and tints, were followed to achieve a masked, yet aesthetic, effect with an extremely thin veneer (Figure 15).
- Finishing was achieved with aluminum oxide discs (Sof-Lex Pop-On XT, 3M, St. Paul, MN), a combination of medium-grit diamonds (#859-018 and #856-L-016, Brasseler, Savannah, GA) and 12-fluted carbide finishing burs (#7901, S.S. White, Lakewood, NJ).²⁸ Surface texturization was accomplished using medium-grit tapered diamonds (6856L-016, Brasseler, Savannah, GA),²⁹ with the anatomic characteristics of the right central incisor as a reference.
- Fine grit diamond strips (Compo-Strips, Premier Dental, Markham, Ontario, Canada) were used to begin removal of excess resin interproximally, without breaking the contact, and were followed by polishing strips (Epitex, GC America, Chicago, IL).
- To prevent the veneer from breaking during its removal, all interproximal resin flashes were removed to the preparation finish lines.

- The veneer was thoroughly buffed with rubber polishers (FlexiCups, Cosmedent, Chicago, IL) in sequential order according to their abrasiveness to eliminate the undesired accentuated texturization.
- A composite polishing paste (Foto-Gloss, Kota, Sao Paulo, Brazil), was used with a buffing disc (Flexibuff, Cosmedent, Chicago, IL) to impart a high gloss to the restoration surface while still retaining the designed surface texture. The convex areas of the restoration (ie, labial lobes and line angles) were further "highlighted" with a superfine disc. Following final polishing, the restoration was light cured for 60 seconds.
- A morphologic symmetry of width, length, embrasure forms, and line angles was now present, and the composite resin veneer was ready to be removed from the tooth preparation (Figure 16).

One of the primary advantages of the direct/indirect veneer ... is the ability to try it in with colored resins ...

- The resin veneer was removed carefully to prevent fracturing. The thin-bladed end of a composite instrument (Goldstein Flexi-Thin Composite Instruments, Mini #3, Hu-Friedy, Chicago, IL) was introduced at the veneer/tooth interface, along the gingival margin, removing the restoration from the preparation (Figure 17).
- The thickness of the veneer (average 0.6 mm) was checked with a caliper. Marginal flashes and excessive contours were removed with coarse discs and polished with superfine aluminum oxide discs (Sof-Lex, 3M, St. Paul, MN) at extremely low speed, to provide greater control over the finishing and polishing procedure (Figure 18). The restora-

tion was placed back on the preparation to ensure accuracy of fit and interproximal contacts.

- The veneer was placed into a heat-and-pressure tempering oven (Ivomat, Ivoclar-Williams, Amherst, NY) at 120°C for 10 minutes and then light cured for 2 minutes.³⁰ As not every clinician has a heat-and-pressure tempering oven available, the author suggests placing the composite veneer in boiling water or in a microwave oven, set at the highest temperature, for 10 minutes.
- One of the primary advantages of the direct/indirect veneer, especially in the case of a single central incisor, is the ability to try it in with colored resins or try-in pastes, prior to cementation. Unlike the direct veneer, there is always the opportunity for modification of hue, chroma, and value to match the adjacent teeth.
- The dry veneer was positioned onto the prepared tooth without any try-in medium to determine whether a color modification would be necessary. When compared to the right central incisor, the veneer presented an elevated value (Figure 19). To determine the degree of discoloration visible through the veneer, water was used as the medium for the second try-in, which imparted a lower value to the restoration (Figure 20). Since water (or glycerin) is clear, it functions as a neutral optical medium that surfaces the shade of the underlying structure. If the veneer matches the adjacent teeth in hue, chroma, and value, a clear resin cement may be used. If an elevated value results, a higher chroma and lower value luting resin should be selected. If a lower value results, a high-value more opaque resin cement should be employed as the cementing medium.
- A light-cured/dual cure resin cement was used for the cementation (Nexus, Kerr, Orange, CA). Best shade matching results were achieved with a mix of 1/3 dark and 2/3 neutral resins contained in the kit.

- After resin cement try-in, the inner surface of the veneer was cleaned with alcohol and dried. To maximize adhesion, the internal aspect of the veneer (an opaque hybrid composite) was sandblasted (Microetcher II, Danville Engineering, San Ramon, CA), (Figure 21) cleaned, acidified with a 35% phosphoric acid gel (Ultra-Etch, Ultradent, South Jordan, UT), and silanated (Scotch-bond Ceramic Primer, 3M, St. Paul, MN).
- The prepared tooth was cleaned interproximally with gauze moistened with 4% chlorhexidine, and a slurry of pumice and 4% chlorhexidine was used on a prophyl cup to clean the labial preparation. The enamel, dentin, and resin surfaces of the preparation were sandblasted in order to optimize bond strengths (Figure 22).³¹
- To prevent bonding to the adjacent teeth, a dead-soft metal strip was placed interproximally, and the prepared tooth was etched with a 35% phosphoric acid gel (Ultra-Etch, Ultradent, South Jordan, UT) for 15 seconds (Figure 23). The etchant was rinsed thoroughly, and the surfaces were lightly air-dried to avoid desiccation.
- The bonding agent (Nexus 1-2-3, Kerr, Orange, CA) was applied to the prepared tooth and to the inner surface of the veneer, according to the manufacturer's recommendations (Figure 24). The veneer was loaded with the previously selected resin cement mix and gently seated (Figure 25). A 3 mm wide turbo tip (Optilus 500, Demetron/Kerr, Danbury, CT) was used to spot-cure for 5 seconds, tacking the veneer into place. Bulk excess resin cement was removed from the veneer with a blunt, rubber-tipped instrument to allow some cement to remain at the tooth/restoration interface. Mylar strips were passed several times interproximally, in a labiolingual motion, to remove excess luting resin.
- Margins were checked for precision of fit with an explorer, to ensure the

veneer was fully seated in the right position. A 13 mm wide tip was used to light cure the veneer from the palatal and labial aspects for 60 and 120 seconds, respectively (Figure 26).

- Additional excess cement was removed with a #12 blade and ultra-fine diamonds from the laminate veneer system kit. Interproximal finishing and polishing was achieved with ultra-thin strips (Epitex, GC America, Chicago, IL) used sequentially, according to their grits. Rubber cups (FlexiCups, Cosmedent, Chicago, IL) were used subgingivally to polish any flashes and irregularities. The veneer was further polished with an aluminum oxide paste and ultrafine disc.
- An aesthetic and natural restoration was achieved, fully satisfying the functional and aesthetic expectations of the patient (Figures 27 and 28).

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CONCLUSION

The direct/indirect composite resin veneer technique is practical and reliable in treating most of the single tooth discolorations. It allows the clinician to artistically treat aesthetically compromised dentition by using restorative material that can be fabricated intraorally, heat-treated to enhance its physical properties, and bonded with resin cements that provide improved shade matching properties. The direct/indirect veneer is a viable treatment modality for clinicians who enjoy free-hand bonding and the artistry that is associated with it, for it permits the operator to create natural restorations that meet the aesthetic and functional expectations of the patient in a single appointment.

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