Conservative approach to masking a darkened tooth with a direct composite resin restoration: a case report with 5-year follow-up

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The objective of this case report is to describe a direct conservative technique for restoring the esthetics and function of a severely discolored endodontically treated tooth. A 25-year-old man presented with an esthetic complaint about severe darkening of his endodontically treated maxillary left central incisor. The tooth had adequate sound tooth structure, so the placement of a conservative direct composite resin veneer was proposed. The preparation included minimal removal of tooth structure, and a photoactivating opacifier was placed to mask the darkened substrate prior to restoration with composite resin. The restorative composite resin was placed with an incremental layering technique, restoring form, function, and esthetics. A routine follow-up examination 5 years after placement of the veneer revealed that it still provided satisfactory function and esthetics despite slight incisal wear and loss of brightness. The placement of direct composite resin veneers in association with opacifying pigments is a simple, low-cost alternative for providing immediate esthetic restoration of teeth with severe color change without extensive removal of tooth structure.

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The public's strong desire for dental esthetics has fostered the development of new materials and techniques that combine esthetics with minimal tooth structure reduction and maximum durability.[1-4] Over time, manufacturers have developed direct and indirect restorative dental materials that are increasingly similar to natural teeth.[5,6] In particular, great advances have been made in resinous materials, and a great variety of low-cost composite resins are available.[4,7]

Among the various indications for restorative treatment with composite resin, masking of hypoplastic stains or dental substrate darkened by endodontic treatment or trauma is a low-cost option that provides good resolution.[4,7-9] However, masking excessively darkened teeth while preserving tooth structure is challenging.[10,11] The masking of severely discolored dental substrates with direct placement composite resins requires the removal of large amounts of healthy enamel and dentin.[8,11] The use of opaque resin pigments prior to the application of the restorative resin layers allows masking of the substrate with less removal of tooth structure.[6,7,10,11]

Exogenous and/or endogenous bleaching can be performed in teeth darkened due to endodontic reasons. However, tooth whitening techniques involve multiple clinical sessions, provide gradual color change, and may have variable results depending on etiologic and temporal factors; moreover, the discoloration may recur.[12,13] The objective of this case report is to describe a conservative direct technique for restoring the esthetics and function of a severely discolored endodontically treated tooth.

Case report

A 25-year-old man was dissatisfied with his smile due to darkening of his maxillary left central incisor (tooth 9). The clinical and radiographic examinations revealed severe darkening of the tooth and previous endodontic treatment (Fig 1). The color of tooth 9 was recorded as A3.5, while the other teeth were found to be A1 on an optical shade guide (Vita Classical, VITA North America). The incisor had an adequate amount of sound dental structure, so conservative treatment with a direct composite resin veneer was proposed to mask the discoloration and restore the incisal edge.

Prior to preparation, tooth 9 was highlighted with an overhead projector marker (Marcador Retro Projetor 2.0, Pilot Pen do Brasil) to allow better visualization and control of the labial surface reduction, enabling a conservative approach (Fig 2). The tooth preparation was performed without a rubber dam and retainer because the original position of the gingiva was used

Fig 1. Pretreatment smile of a patient with a darkened maxillary left central incisor.

Fig 2. Demarcation of the tooth for better visualization and control of tissue removal.

Fig 3. Preparation for a direct composite resin veneer.

Fig 4. Application of a thin layer of opacifier.

Fig 5. Palatal incisal edge recreated with shade A1 enamel composite and radiopaque halo developed with dentin composite.

to determine the cervical margin without risk of violating the biologic width. Vertical grooves were made in 3 inclinations on the labial surface with a 1.2-mm-diameter tapered cylindrical diamond bur (No. 2135, KG Sorensen). A 1.2-mm-diameter round diamond bur (No. 1012, KG Sorensen) was used to define the limits of the cervical sulcus, and the No. 2135 bur was then used to remove tissue from the labial surface, using the vertical grooves as a guide. Tissue removal from the labial surface was approximately 0.8 mm deep. The burs penetrated the enamel and dentin to just over half the diameter of their active tips. The cervical end of the preparation was placed subgingivally while respecting the biological width. On the proximal surfaces, the mesial and distal limits of the preparation respected the contact points (Fig 3).

After preparation, absolute isolation was achieved, and a retraction clamp (No. 212 KSK, Dentech) was placed on the prepared tooth to ensure complete exposure of the cavity preparation. Tooth 9 was etched with 37% phosphoric acid (Power Etching, BM4), and an adhesive system (Single Bond 2, 3M) was applied. Next, a thin layer of photoactivating white opacifying pigment (Tetric Color, Ivoclar Vivadent) was placed (Fig 4). The dye was applied in amounts that partially masked the darkened substrate. Subsequently, the composite resin (Filtek Z350 XT, shades A1D, A1B, A1E, and CT; 3M) was placed with an incremental and stratified technique. The palatal incisal edge was recreated with shade A1 enamel composite, and the radiopaque halo was developed with dentin composite (Fig 5).

The completed direct composite resin veneer closely simulated the right central incisor in shape, contour, translucency of the incisal edge, and appearance of the radiopaque halo (Fig 6). The harmony of the patient's smile was restored (Fig 7).

Routine reexamination of the restoration 5 years after placement revealed slight incisal wear and loss of brightness, but the function and esthetics of the composite resin veneer remained satisfactory (Fig 8).

Discussion

The esthetic restoration of a single anterior tooth is considered difficult, and teeth with severe darkening are particularly challenging.[10,11] Several techniques and materials are available to improve the esthetics and therefore the harmony of the smile. Regardless of the technique chosen, the clinician must have comprehensive technical and scientific knowledge to achieve successful outcomes in such clinical situations.[4,7,14]

Exogenous and/or endogenous bleaching can be performed in teeth darkened due to endodontic reasons.[12,13] As noted earlier, bleaching of endodontically treated teeth can have variable results that may not be permanent.[12,13] In the present case, a restorative treatment without tooth whitening techniques was planned with the objective of achieving an immediate, predictable, and lasting esthetic resolution.[11,15]

The choice between a direct or indirect restorative technique depends on factors such as the cost, fabrication time, possibility and ease of repair, durability, and patient's expectations.[15,16]

Fig 6. A. Completed direct composite resin veneer on the left central incisor. B. Restoration closely simulating the right central incisor in shape, contour, translucency of the incisal edge, and appearance of the radiopaque halo.

Fig 7. Restored smile immediately after completion of the direct composite resin veneer.

Fig 8. A. Appearance of the composite resin veneer after 5 years. B. Function and esthetics remain satisfactory despite slight incisal wear and loss of brightness.

In the present case, direct restorative treatment with a composite resin veneer was chosen because the fabrication time, cost, and amount of tooth preparation required for indirect restorations are sometimes greater than those associated with the direct technique. A no-preparation restorative technique was not used because the amount of composite resin needed to mask the discoloration would have increased the volume of the labial surface.

The preservation of healthy structure in the direct veneer technique is aided by the possibility of masking discoloration with opacifying pigments before placement of the composite resin layers.[11] It may be necessary to use opacifiers to achieve complete masking of severely darkened substrate because of the inherent translucency of restorative composite resins.[5] Without opacifiers, a larger volume of opaque resin is needed to mask darkened substrate, especially in more conservative preparations. The application of opacifying pigments allows removal of less tooth substance and use of a smaller volume of direct restorative material. Therefore, the direct technique associated with the use of opacifiers is less invasive than the indirect technique involving opacifiers.[11]

The use of opacifying pigments may lead to decreased bond strength as these pigments are basically fluidized resins added to opaque dyes. Thus, the use of these pigments should be limited to small quantities.[10] The opacifier used in the present case was so thin that it was still possible to partially visualize the darkened substrate after application of the pigment.

At a routine follow-up examination 5 years (62 months) after placement of the restoration, its esthetics and functional integrity were confirmed. The margins showed no clinical signs of infiltration, discoloration, or displacement. The color maintenance was also considered satisfactory. Despite a slight color change, the restoration still registered as A1 on the optical shade guide. Slight incisal wear, which coincided with protrusive movements, was noted but within acceptable limits considering the mechanical characteristics of direct placement resins and dental enamel and their constant function. It is speculated that the success after 5 years was related to the satisfactory bond strength of the composite resin to the tooth, despite the use of the opacifier; the stability of the protrusive guidance; the absence of parafunctional habits; and the patient's satisfactory oral hygiene.

The success of direct restorative techniques is dependent on the ability of the operator to restore the shape, contour, and, above all, the color of the natural tooth. Understanding and mastering the combination of opacifiers and restorative resins that have varying opacity and translucency are critical to success of the final color of the tooth. When performed correctly, restoration with a direct composite resin veneer is a simple technique that provides immediate, satisfactory, and durable functional and esthetic results in a single clinical session.[6,10,11]

Conclusion

The use of direct placement composite resins in combination with opacifying pigments in conservative preparations is a simple and reliable alternative for the immediate esthetic restoration of teeth with severe color change. In addition to providing satisfactory esthetic and functional results, this treatment approach is low cost and, most important, requires less removal of healthy tooth structure.

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The authors report no conflicts of interest pertaining to any of the products or companies discussed in this article.

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