

“Resin Composite—State Of The Art”

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Abstract

Esthetic restoration of the smile: directly veneering a discolored anterior tooth• Case report: Although direct composite veneering discolored anterior teeth is quite widespread, proper reproduction of their natural appearance requires much from the professional. The restoration and re-establishment of a patient's dental aesthetics is among the important requirements of dentistry today Restorative dental practice has been expanded and revolutionized by recent developments in the field of adhesive dentistry . Porcelain veneering is considered the gold standard as an esthetic restorative option when used for the right clinical case . Direct composite veneers provide an additional viable option to the clinician to use where porcelain veneers cannot be used of afforded. Mastering the art of direct composite resin veneering is not easy and is highly technique sensitive. Here we present a case reports of single visit direct composite veneering of anterior teeth using direct composites.

Key Words: Veneers; composite resin; direct composite veneering ; aesthetics.

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I. Introduction

Direct composite resin veneers are a practical esthetic restorative treatment for reestablishing the shape and color of affected anterior teeth.[1] After the introduction of dentin bonding agents and further development of resin composites, direct resin composite has become a more conservative treatment for esthetic problems in the anterior dentition.[2] Until the mid to late 1980s, there were few composite based resins available on the market that presented good esthetic characteristics.[3] Only after the introduction of composite systems that provided dentin and enamel shades did the color selection process become easier and direct restorations began to look better and more lifelike.[1-3]

Currently, nanofiller composites are not only timeand cost-effective, but they are also ultimately a high-quality and long-lasting treatment of choice.[2]They present superior strength, excellent physical and optical/color properties, and improved polishing characteristics compared with early macrofills, which allow composite resins to be successfully used in stress-bearing and esthetic areas.[4] This allows clinicians to perform artistic restorations, which can mimic the natural dentition and can equal or even surpass dental ceramics.[1,2]

The need for esthetic treatment emerges from different systemic preconditions as well as various genetic, dental and traumatic reasons [3, 4, 5]. Key factors for treating these cases are composite materials and adhesive systems. Layered technique using different shades produces excellent bio-mimetic restorations. By utilizing positive characteristics of these materials high esthetic and functional effects can be achieved [6].



Figure 1; The preoperative smile showing the discolored right central incisor

Modern composites allow reconstruction of the outer forms and colors but also reproduce inner tooth structure. Esthetic restoration mimics optical characteristics of natural tooth [7, 8]. Nano-technology of composite materials has simpler color structure and very intense ‘chameleon effect’. It allows excellent modeling of the filling and complex teeth restoration in anterior and posterior regions.[9] Clinical procedure for direct composite restoration involves: respecting individual morphological characteristics of teeth, choosing appropriate shades, proper teeth preparation, anatomic layered technique and final finishing and polishing.[7,8] Applying layered technique provides anatomical teeth form, however, requires long application time. On the other hand, layered technique sometimes traps air causing voids in the composite that later became stained. That lowers esthetical characteristics of restorations over time [9, 10]. These problems can be overcome with new composite systems that allow easy restoration of anterior teeth by the application of already made composite veneers. [7,9,11] This is convenient when changing shape of the tooth is also required. Excellent results have been reported in restoring fractured and destroyed teeth, morphological and structural deviations, discolored teeth and diastema, caries, trauma, erosion, abrasion, fractures and minor orthodontic deviations [11, 12]. Direct composite systems offer treatment that is both for the patient and dentist more economical and can be finished during only one visit.[6,7,10,11]



Figure 2; The discolored right central incisor.

Direct composite veneering results in minimal invasion and maximum preservation of sound tooth structure when compared to indirect restorations.[1,2] These restorations can be easily repaired which is a more conservative and preferable option than replacement.[3] Thus, direct composite resin restorations have become a viable alternative for young patients that require anterior restorative procedures. [1,2]

These restorations are easily repaired, making them a more cost-effective and preferable option to replacement. As a result, direct composite veneers have emerged as a viable option for young patients in need of anterior restorative procedures [4]. Here we present a case reports of single visit direct composite veneering of anterior teeth using direct composites.

II. Clinical Case

The patient presented to the dental office with a discolored right central incisor (tooth No. 8) (Figure 1). The tooth had a history of trauma, but it remained vital. Composite resin had been previously placed on the tooth several times, but it never matched the adjacent tooth. The patient did not like the color or the contour of the restoration (Figure 2). It was decided that a direct composite veneer would be placed using a hybrid material, microfill, opaquers, and tints.



Figure 3; Preparation of the right central incisor.

Before beginning the case, the tooth was color-mapped and the corresponding materials were placed in a ResinKeeper to expedite the procedure (Figure 3).

The old composite restoration was removed using carbide burs until the tooth structure was exposed. A chamfer diamond bur was then used to prepare the tooth structure for the resin. Approximately 0.7 mm of enamel was removed to provide the necessary room for multiple layers of material. Care was taken to maintain as much enamel as possible, which would enhance the bond strength of the restoration. The preparation followed the contour of the gingival tissue and the margins were placed equigingivally. No incisal wrap was created (Figure 3). To keep the restoration from being bulky and provide seamless margins, it is necessary to remove some tooth structure when placing direct composite veneers.

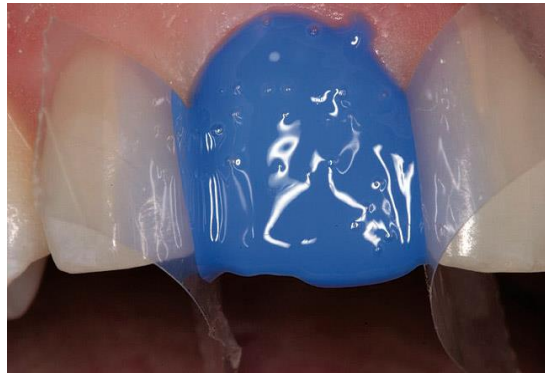


Figure 4; The tooth was etched for 20 seconds



Figure 5; Frosty appearance of enamel.

Clear matrix strips were placed interproximally before etching to prevent bonding to the adjacent teeth. The tooth was etched for 20 seconds (4), rinsed, and air-dried. If dentin was exposed, the tooth would not have been air-dried. Because of the minimal preparation design, no dentin was exposed, which allowed a total enamel bonding substrate (Figure 5). One-Step Plus was placed on the tooth in multiple coats for approximately 20 seconds. This was lightly air-thinned to remove the solvent. Because no dentin was exposed, a conventional unfilled resin could have been used. (Figure 6)



Figure 7; Placement of the Renamel® hybrid with a long-bladed instrument.

The initial layer of A1 hybrid Renamel was applied and contoured with a long-bladed composite instrument (Figure 6). The layer was then smoothed with a #3 Cosmedent brush and light-cured for 20 seconds. Care was taken to ensure the material was as thin as possible to block the underlying dark color. It is very important to constantly monitor the thickness of the composite material from the incisal aspect. Overbuilding would not allow sufficient space for the microfill layers. This could make the tooth appear too bulky. This layer should be fairly smooth (Figure 7). The opaque nature of the hybrid does an excellent job of blocking dark substrates. If the value of the tooth needs to be raised, an opaquer can be used. In this case, the Creative Color A1 opaquer was placed in a very thin layer to increase the overall value. This was placed with a #1 Cosmedent brush (Figure 8) and light-cured for 20 seconds.



Figure 7; Appearance of the tooth after placement of hybrid.

Two different shades of microfill were used to replicate the adjacent tooth color. A1 Renamel microfill was placed at the cervical area and sculpted down with a long-bladed composite instrument to the incisal edge. This was then thinned to make room for the second shade (Figure 9). Because the adjacent tooth exhibited more chroma at the cervical edge, one shade darker A1 microfill was used there. Because of the higher value at the incisal half, the next increment of microfill (B-1) was placed at the incisal area and blended into the cervical portion.

Brushes and a long-bladed instrument were used to form some irregularities for the dentinal lobes (Figure 10). To highlight the dentinal lobes and re-create the natural effect of the adjacent tooth, a violet tint was applied in a very thin wash vertically at the incisal edges of the composite and in between the projected lobes in accordance with the color mapping (Figure 11). White opaquer was placed at the line angles to aid in further creating a mirror image of the left central incisor (Figure 12).



Figure 8; Creative Color opaquer was placed to increase the value.

Tints cannot be placed on the surface and polished. They must be covered with an incisal shade of composite. This was accomplished by placing a final layer of Light Incisal microfill, which allowed the underlying previously placed colors to shine through (Figure 13). The final layer was slightly overcontoured to allow sufficient thickness for finishing and polishing (Figure 14).

To replicate natural form and texture, the initial contouring was performed with a series of finishing burs and discs. Line angles are clearly defined by the light reflective surface. To make a tooth appear wider, the line angles can be moved more to the interproximal edge. To give the appearance of a narrower tooth, the line

angles are moved more toward the center of the tooth. Before finishing, the heights of contour of the line angles were drawn on the two centrals (Figure 15). The right central appeared wider; therefore, the line angles were moved more toward the body of the restoration, not interproximally. If a disc is used, there is a tendency to make the tooth wider and flatter as a result of the nature of the finishing. An ET9 carbide bur was used initially to flatten the facial surface and move the line angles. The final position of the line angles should be a mirror image of the left central incisor. Polishing discs were used at low speed without irrigation or polishing pastes to smooth the surface and keep the interproximal clear (Figure 16).



Figure9; Placement Of The A1 Microfill.



Figure 10; Placement Of The B1 Microfill And Slight Development Of Dentinal Lobes.



Figure 12; A Violet Tint Was Applied To Tooth



Figure 12; White Opaquer Was Placed At Line Angles.



Figure 13; Application Of The Light Incisal Microfill.

Surface texture and final polishing were accomplished with a 7404 carbide bur at low speed using a back-and-forth motion along the entire tooth structure .

Development of a high luster depends on the particle size of the composite. Microfill composites have a smaller particle size; therefore, they polish much better and hold the polish over time. Hybrid composites with a larger particle size are more difficult to polish and do not maintain the polish over time. The newer nanofilled composites are easier to polish, but are not quite as polishable as microfills. A FlexiBuff with Enamelize polishing paste was used for the final polishing step to develop the high-gloss surface polish . A high gloss allows the restorations to last longer without staining. Figure 14 shows the immediate postoperative restoration. The final restoration at the 6-month recall is shown in Figure 18 .



Figure 14; The Restoration After Layering (Before Finishing).



Figure 15; The Height Of Contour Was Drawn On The Central Incisors.

III. Discussion

The importance for esthetics is increasing in the practice of modern pediatric dentistry. The demand for esthetic motivates the patient to seek dental treatment which is often dictated by cultural, ethnic, and individual preferences.[13] The aim of treatment for both the cases is to restore patient’s esthetics and self-esteem.



Figure 16; A medium FlexiDisc (Cosmedent, Inc, Chicago, IL) was used for contouring and polishing.

Direct and indirect veneers, as esthetic procedures, have become treatment alternatives for patients with esthetic problems of anterior teeth in recent years. [2,14] In deciding between those two treatment options, the cost, social and time factors have to be considered. [13,15] Although ceramic laminate veneer restorations have some advantages like color stability and high resistance against abrasion, they have also some disadvantages, including high cost and long chair time. [15] Moreover, they have some problems such as necessity of an additional adhesive cement. (Figure 17)



Figure 17; The direct composite veneer immediately postoperative.

Composite resins increase physical characteristics, rectify existing defects, and are now more visually acceptable alternatives to laminate veneer applications. Furthermore, more conservative treatment choices are required in today's dentistry. As a result, one of the finest treatment alternatives is composite veneer restorations, which require little tooth structure removal [2, 16]. Direct composite veneers are easy to polish, and any cracks or fractures may be fixed intraoral. In addition, marginal adaption outperforms indirect veneer repairs. The use of cautious direct composite resins in these circumstances resulted in symmetrical and harmonious tooth replacement. [17]

Case selection is critical for the success of this direct restorative technique, with ideal clinical indications including tooth discoloration, anatomical deformities, diastema, and misaligned or worn dentition. (Figure 1,17)



Figure 18; The direct composite veneer at the 6-month recall.

The natural layering concept technique was applied to build the restorations for achieving the expected natural results.[5,23] This required only three basic steps:

- (1) selection of the dentin shade resin in the cervical area of the tooth;[20]
- (2) selection of enamel tint or translucent resin by simple observation, mainly at the incisal area; [17]and
- (3) preparation of a chromatic map , in which the optical effects of the tooth and its peculiarities are noted.[19]

Nevertheless, a natural slight translucency was detected in the incisal area. In this technique, the resin composite increments were placed respecting the natural layering of dentin and enamel, that is, a thicker layer of dentin-like composite was placed at the cervical area, simulating the greater thickness of dentin in this region; at the incisal third, the dentinlike composite was thinner and the translucent enamel-like composite was thicker, as with a natural tooth.[20] Incisal effects, such as opalescence, white spots, or hypocalcifications, can be performed using resin-based tints underneath the translucent enamel-like composite.[1,2,6,21]

The natural layering concept through a logical application of two separate composite masses makes the whole procedure easier, efficient, and predictable, which greatly contributes to the clinical practice. [11]The dentin-like composite can be selected using the traditional VITA shade guide , and three basic rules can be applied for enamel-like composite selection:

- (1) young enamel appears more milky and less translucent (white semitranslucent composite); [17]
- (2) adult enamel has intermediate translucency (thinner layer of white semitranslucent composite or thicker layer of neutral translucent composite); and[17]
- (3) old enamel has higher translucency (translucent neutral composite).[24]

To build the natural effect of teeth, it is necessary to perform a minimal observation of the healthy adjacent teeth and make a chromatic map .Peculiar effects of the tooth should be produced using specific composites with certain optical effects: high opalescence can be reproduced using a slightly blue translucent composite, less opalescence using a neutrally translucent composite, and white spots or yellowish effects using resin-based tints. [19,20]Thus, although the use of novel direct composite resin systems enables clinicians to exercise creative control over the restorative process, the success of esthetic restorations also requires an understanding of natural tooth structure.[24,25]

Finally, finishing and polishing steps are crucial to the maintenance and longevity of composite restorations.[24,25]As a result of the improvement of resinbased composites, the most important changes have involved the reinforcing fillers, which have been purposely reduced in size to produce materials that are more easily and effectively polished and that demonstrate greater wear resistance.[17,19,20]

Composite resins with improved material properties correct existing deficiencies, increase physical properties, and are now more aesthetic alternatives to laminate veneer applications. [6,7]Composite veneering improved not only the patient's aesthetic but also functional and psychological needs.[10] The patient received positive feedback in terms of aesthetics and function following the final postoperative treatment. Discolorations and disintegration of composite material were checked during follow-up visits. [11,23,13]Finishing burs were used to smooth any roughened areas, and interdental plaque was removed with interdental floss .[17,19,20]

IV. Conclusions

Direct composite veneers should be an addition to most dentists repertoire of services for restorative and cosmetic treatments, because with the proper materials and methods they're easier, more predictable and more profitable than ever before. Direct composite veneers are well indicated as an approach to improve tooth color and esthetics. This treatment presents advantages, including satisfactory bonding between resin composite and dental substrate, low cost, less clinical time, and acceptable esthetic results due to the improved optical and mechanical properties of composites.

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