

Class IV direct composite restoration: a case report

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ABSTRAK

Selama beberapa tahun terakhir, perkembangan teknologi bahan resin komposit telah menjadikan prosedur penambalan gigi secara langsung dengan menggunakan bahan resin komposit menjadi salah satu perawatan alternatif yang lebih menjanjikan. Salah satu tantangan terbesar dalam kedokteran gigi estetik adalah membuat keserasian warna antara bahan tambalan dan struktur gigi alami. Pada gigi alami, struktur gigi yang berbeda dapat memantulkan, merefraksi dan menyerap pancaran sinar melalui struktur yang berbeda (misalnya enamel rods, tubulus dentinalis, dentinoenamel junction). Resin komposit memperlihatkan hasil yang memuaskan dalam sisi estetik berdasarkan kemampuan bahan untuk memantulkan, merefraksi dan menyerap cahaya sehingga terlihat menyerupai gigi alami. Penambalan langsung dengan resin komposit yang dikombinasikan dengan ketrampilan dokter gigi dalam menghentikan perkembangan karies gigi dan mempertahankan vitalitas gigi, maka hasil perawatan estetik yang didapatkan akan jauh lebih memuaskan.

Kata kunci: penambalan langsung dengan resin komposit, resin komposit, perawatan restorasi estetik

ABSTRACT

During the last several years, the technological development of composite resins has made the direct-resin restoration an even more viable long-term treatment alternative. One of the challenges of esthetic dentistry is creating predictable color harmony between the restorative material and the natural tooth structure. In natural dentition, different aspects of tooth structure will reflect, refract, and absorb light wavelengths to different degrees (e.g. enamel rods, dentinal tubules, dentinoenamel junction). The newer composite resins are showing promise for their aesthetic indications based on their abilities to reflect, refract, and absorb light in a manner similar to natural dentition. When this treatment potential is combined with our ability to eliminate the carious disease process and heal the dentition, we can move in a direction that may enable better approaches to esthetic restorative care.

Keywords: direct-resin restoration, composite resin, esthetic restorative care

INTRODUCTION

The growing demand for esthetic results has changed the way dentistry is practiced in the twenty first century.¹ In the past, recreating the unique characteristics of natural dentition could be difficult and confusing.² In recent years, significant improvements in composite resin technology have occurred.³ Dental composites have advantages as a restorative material in terms of esthetics, conservation of tooth structure, adhesion to tooth structure, and low thermal conductivity.¹ Manufacturers released multiple composite shades, opacities, and translucencies, all of which were required to reconstruct individualized teeth.² A more modern material is the nanofilled composite. The monomer matrix usually contains filler 3 to 10 micrometers in size to resist occlusal loading in molar regions and nano - sized fillers for improved surface quality. The development of these of composite materials has provided clinicians with the ability to directly restore fractured and misshapen teeth and to repair defective enamel.^{3,4} These new composites address demands for minimally invasive treatments while providing increased strength and optical characteristics, universal application, improved adhesion, and optimal handling and sculptability when reconstructing the biological, esthetic, and physical architecture of natural teeth.²

Direct composite resin bonding procedures are growing in popularity as conservative and predictable restorative treatment alternatives. These procedures became overwhelming and time consuming.³ Fortunately, dental material manufacturers have helped to improve and enhance dental treatments by developing direct composites that simplify the layering process.² An understanding of the fundamental layering, contouring and polishing principle is paramount to the success of any direct composite restoration. The build-up or layering technique itself is one reflective of ceramist's principles. These use materials to interplay with light and recreate the hues, chromas, and values of color inherent to the tooth structure being replaced. The direct composite build-up steps represent a process for completing a layered restoration similar to one fabricated with ceramic to replace dentin, enamel, dentin lobes, and characteristic colors.⁵

Some of the essential procedures that are completed prior to a direct composite preparation and restoration include diagnosis and treatment planning, shade selection, assessment of occlusion relative to the proposed restoration, and a field of isolation decision. An important step in esthetic restoration of an anterior tooth is shade selection. A shade guide is only useful for a general determination of color. A pretreatment assessment of occlusion with articulating paper is done to guide the practitioner in preparation design. The objective of pretreatment is to avoid the development of excessive occlusal contacts on the restorative material or margins, which may result in decreased restoration longevity.¹

This case presentation demonstrates the restoration of a class IV which was treated with acrylic veneer by dental technician. The patient came to clinic with unfixed restoration after 3-year placement.

CASE REPORT

Diagnosing and treatment planning

A 29-year-old man came to clinic with the chief complaint of unfixed anterior maxillary veneer restorations (Figure 1A). On examination, it was found that the restoration made from acrylic materials by dental technicians. It was used for 3-years without any complaint till today. There was a less gingival recession with mild inflammation around gingival margin of anterior maxillary teeth. There was unnecessary removal of tooth structure and severe preparation from enamel to dentin which was made for retention of acrylic veneer restoration (Figure 1B). He requested only reversible and repairable restorations and chose direct composite restoration due to less period to complete his esthetic problem.

Pra-treatment prior to direct restoration

After local anesthesia 1:100.000 (Septocaine, Septodont) was given to the patient, scaling and root planning was made to diminish mild gingival inflammation. The teeth were polished with combination of prophylaxis cup, pumice and CPP-ACP paste (GC Tooth Mouse) (Figure 1C). Before direct composite restoration was performed, a diagnostically enhanced model was created from preoperative impressions (Figure 2A). This model would also be used for fabricating a high viscosity putty stent (Exaflex Putty Type [GC America]) then placed intraorally. This stent also would help maintain the facial/lingual line angles. A comprehensive intraoral examination was performed that included an oral history and photographs. The patient was in good health, and nothing contraindicated direct composite restoration of teeth No. 11 and 21.

Morphologic, histologic, and optical characteristics of the teeth were examined. To select the appropriate composite shade for replacing the old restorations, nanohybrid composite materials (Tetric N-Ceram [Ivoclar Vivadent]) in shades A2, A3, and A3.5 Dentin were previewed side by side on teeth No. 11 and 21. This enabled the dentist to select the appropriate shades for the case, with shade A3 being the lingual enamel layer and shade A2 as the final composite layer.

Preparation protocol

The teeth No.11 and 21 were prepared using diamond burs (Mani-bur [Japan]) and bevel was created (Figure 2B). The class IV preparations were made for each anterior maxillary tooth. The teeth were dried. The preparations were etched with 37% phosphoric acid (Email preparatory blue [Ivoclar Vivadent]) for 20 seconds, rinsed, and dried. Then, a single-dose bonding agent (Tetric N-Ceram Bond [Ivoclar Vivadent]) was applied onto the preparations using a brush for 15 seconds. The bonding agent was air-thinned with high pressure and light-cured for 10 seconds per tooth.

Tooth No.21 was restored firstly. The thin Tetric N-Ceram composite in shade A2 was placed on putty type covered palatal area tooth no. 21 (Figure 2C). Then, the putty stent was placed intraorally and cured for 20 seconds (Figure 3A). Tetric N-Ceram composite in shade A3.5 Dentin was applied in a 1.5-mm thick increment to form the dentinal palatal layer and cured for 30 seconds. In order to assess this palatal layer, the putty stent was removed (Figure 3B). To verify length and width of the restorations, the putty stent again was placed intraorally, and the A3.5 Dentin composite shade was placed, sculpted (Optrasculpt [Ivoclar Vivadent, Amherst, NY]), and cured for 20 seconds. The shade A3 composite was placed, sculpted, and cured for 10 seconds. The final A2 material was applied to the anterior tooth, sculpted, and light-cured. The restorations were then finished using a series of polishing rubbers (Astropol [Ivoclar Vivadent]) and blade no.12 to remove excess of interdental composite resin. The tooth

No. 11 was restored with the same procedures of tooth No.11. The final results demonstrating the imperceptible restorations are shown in Figures 3C and 3D.



Figure 1. A. Close-up preoperative view of teeth No.11 and 21; B. Close up preoperative view, after acrylic veneer is removed; C. Polishing anterior maxillary teeth to remove soft debris.



Figure 2.A. An enhanced wax-up model demonstrated anticipated treatment outcomes; B. Final preparation of teeth; C. The thin Tetric N-Ceram composite in shade A2 was placed on putty stent to cover palatal area tooth No. 21.

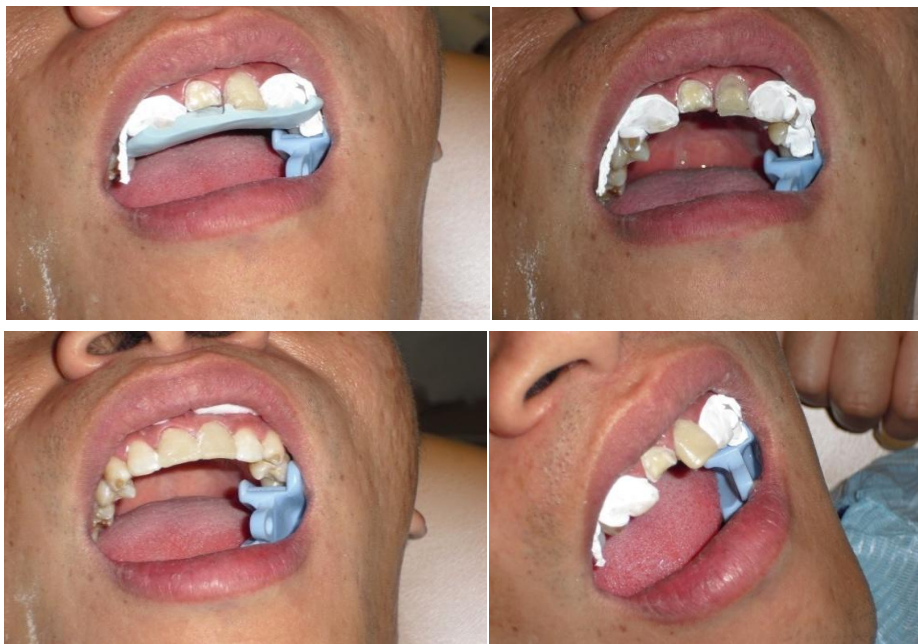


Figure 3. A. Intraorally placing of putty stent during restoration on tooth No. 21, B. The putty stent is removed due to assessing the palatal layer, C. Complete restoration

DISCUSSION

Patient demand for esthetic dentistry with minimally invasive procedures has resulted in the extensive use of freehand bonding of composite resin to anterior teeth. Preservation of remaining tooth structure and using as much enamel to bond to, has made the procedure very predictable.^{8,9} The single anterior tooth replacement represents a complex restorative challenge for the clinician in either composite restorative resins or porcelain systems. The challenge exists while attempting to achieve true harmonization of the primary parameters in aesthetics (ie, color, shape, texture). While porcelain

designing relies on stone models, photographs, and the clinician's laboratory narrative description to the technician, direct restorative resin reconstruction relies on the surrounding dentition for correlation.⁶

Patient's increasing demand for optimal esthetics with less invasive procedures has resulted in the extensive utilization of freehand bonding in the anterior region.^{10,11} To achieve a functionally successful and natural appearing direct composite restoration, the clinician must have a comprehensive knowledge of adhesive dentistry, including the properties of composite resins, proper tooth preparation techniques, and an understanding of the primary and secondary optical properties of the natural tooth and their relationship to anatomical morphology.⁶

The class IV lesion in this case is significant; thus, a diagnostic cast is prepared to be used for the fabrication of a diagnostic restoration and silicone matrix. The silicone matrix is sectioned and used in the creation of the lingual shell of composite, which will act as a base for subsequent increments. The dentin shade is obtained from the gingival one - third where enamel is thinnest. The dentin shade is utilized to replace dentin and the incisal shade of composite creates the incisal edge so that it matches the translucency of the adjacent incisors. The enamel shade is acquired from the middle one - third where enamel is thickest. The incisal region of the tooth is checked for translucency and the shade is chosen accordingly.¹

Hybrid composites blended in larger particle fillers to improve strength but were less polishable, resulting in more of a matte rather than gloss finish. They were chosen for their durability for posterior restorations in which strength was essential.⁷ The nanohybrid composite resin (Tetric N-Ceram) chosen for use in this particular case includes 30% to 50% less resin compared to other microhybrid resin-based restoratives. As opposed to glass particles between 400 and 5,000 nm found in conventional composites, this composite resin contains very small designer nanoparticles made from dioxide filler particles grown to 20 to 40 nm, then covered with a special coating. Glass ceramic fillers with an average particle size of one μm combined with the designer nanoparticles create a nanohybrid composite which outperforms conventional composites that have limited use.²

CONCLUSION

The clinician must have an understanding of color and anatomical form in order to replicate natural teeth. As clinicians to restore a more significant class IV lesion with direct composite restorations, it is important to know the principles of nature and to correlate it with restorative materials.

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