

GINGINEERS

An Innovative Direct-Indirect
Approach to White-Pink
Esthetics



Newton Fahl Jr., DDS, MS
André V. Ritter, DDS, MS

Abstract

Gingival recession can lead to an increased risk of caries, periodontal disease, hypersensitivity, abfraction lesions, and esthetic issues. While soft tissue grafts and other surgical periodontal procedures have been used to treat gingival recession, not all patients will agree to surgical intervention. One alternative that has been employed in select cases to address gingival recession from both an esthetic and restorative standpoint is the use of gingiva-colored composite and ceramic materials. This article describes an innovative application of the direct-indirect composite veneer approach, which the authors call the *gingineer* technique, that incorporates gingiva- and tooth-colored composites.

Key Words: composite resins, veneers, Class V, direct-indirect, pink composites



“A technique . . . that provides enhanced marginal adaptation and surface polishing with no soft tissue trauma is the direct-indirect approach.”

Introduction

It is estimated that gingival recession affects more than 50% of the adult population.^{1,2} This condition can lead to a host of clinical problems, including increased risk of caries, periodontal disease, dental hypersensitivity, abfraction/noncarious cervical lesions (NCCLs), and esthetic concerns. Soft tissue grafts and other surgical periodontal procedures have been used with remarkable success to treat gingival recession,^{3,4} but not all patients will consent to surgical intervention.³ One alternative to address gingival recession from an esthetic and restorative standpoint is the use of gingiva-colored composite and ceramic materials. The use of these pink restorative materials to prosthetically rehabilitate oral tissues and structures is well documented.⁵⁻⁷ From polymethylmethacrylate- and ceramic-based materials, which are extensively used in removable and fixed prostheses, to localized applications of pink composite to cover individual exposed root surfaces,^{8,9} pink restorative materials are highly versatile. They should be considered an integral part of the dental armamentarium.

When utilized for individual teeth and to enhance esthetics where there is gingival recession and the patient does not want surgery, pink composite has traditionally been applied using a direct approach (i.e., following the same surface preparation, bonding, curing, finishing, and polishing techniques that are commonly used for the direct restoration of teeth with tooth-colored composite resins).

Direct-Indirect Technique

One of the direct restorative approach challenges, which is also a challenge when using tooth-colored composites on surfaces immediately adjacent to the soft tissue margin, is the proper adaptation, finishing, and polishing of the restorative material's margin without trauma to the protective and supportive periodontal apparatus. A technique that has recently been revisited that provides enhanced marginal adaptation and surface polishing with no soft tissue trauma is the *direct-indirect* approach.¹⁰⁻¹³ In the direct-indirect composite technique, which can be performed for Class V restorations, veneers, contact lenses, and select Class IV cases, the composite is initially applied to the tooth without any bonding agent, sculpted to a primary anatomical form with slight excess, and then light-activated. The polymerized material is then removed from the tooth, finished to the final anatomy, and processed extraorally before being luted. Documented advantages of this technique¹⁰⁻¹² include enhanced finishing and polishing and the ability to try in the veneer before luting when using extremely thin veneers (i.e., contact lenses). This enables a shade verification and modulation process that is not possible with the direct technique. An additional benefit of the direct-indirect approach results from heat-tempering the veneer, which affords enhanced optical and mechanical properties. Furthermore, the direct-indirect approach, which the authors have termed the *gingineer* technique, improves gingival health and patient comfort.

Case Report

Patient Complaint and Findings

A 54-year-old female presented to the authors' clinic with a chief complaint of localized hypersensitivity on several teeth secondary to gingival recession and root exposure (Fig 1). She was also unhappy with the color and shape of her maxillary anterior teeth, which were discolored and not harmonious. Clinical findings included a low smile line (Figs 2a-2c), localized defective composite bonding on #8, slightly linguoverted maxillary canines, asymmetric lateral incisors, a diastema between #7 and #8, and open gingival embrasures ("black triangles") between #8 and #9 and between #9 and #10. Gingival recession was noted at #6, #9, #10, and #11, with minimal to no loss of tooth structure in those areas (i.e., no abfractions/NCCLs). There were no other contributory findings.



Figure 1: Initial presentation. The patient's primary concerns included localized hypersensitivity secondary to gingival recession and root exposure, as well as the need for esthetic improvement.

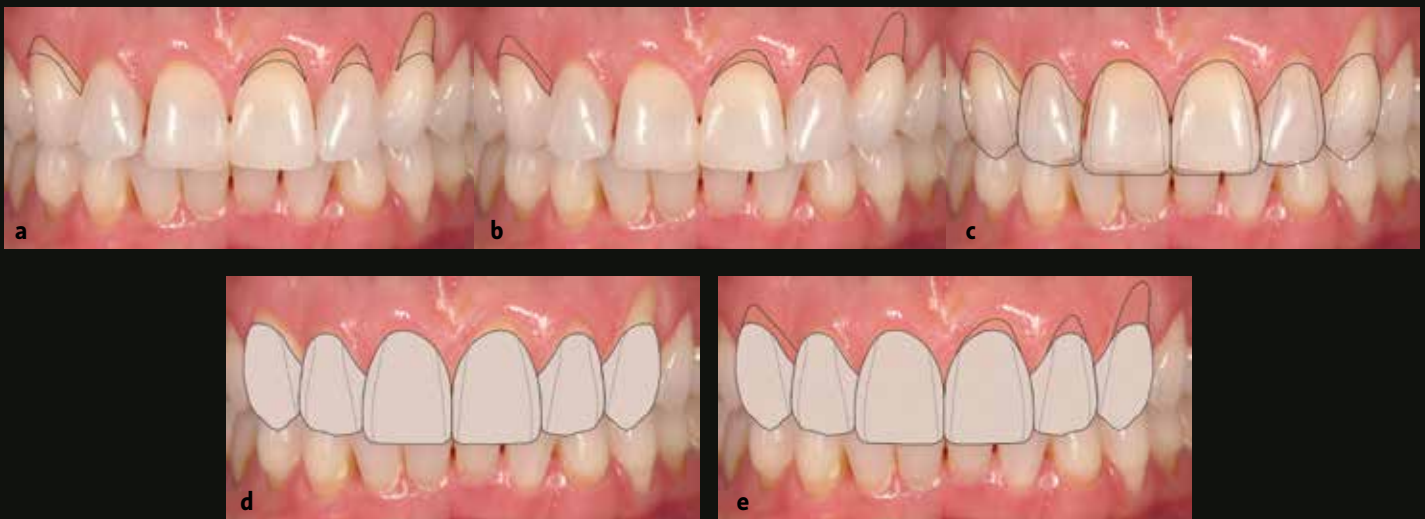
Treatment Options

The patient was presented with several treatment options for each of the abovementioned findings. Given that her chief complaint was hypersensitivity, the options presented included a combination of topical desensitizing therapies and gingival grafting to cover the exposed roots. The patient adamantly declined any surgical intervention.

Because the patient also wanted to improve the color and morphology of her maxillary anterior teeth, for which a combination of tooth whitening and direct-indirect partial veneers/contact lenses was recommended, an alternative to the more ideal soft tissue grafting was proposed: adding pink composite to the direct-indirect veneers to address not only the root exposure but also restore the contour of the gingival margin to a more



Figures 2a-2c: There was no display of uneven gingival architecture when the patient smiled. Despite this, the need for slightly longer and larger teeth was obvious.



Figures 3a-3e: (a) The gingival recessions were outlined to show the extension of the defects. (b) The outlined shapes were filled with gingiva-colored material to simulate soft tissue grafting. (c) Digital planning was used to create a clear outline of the ideal contours and proportions. (d) The outlines were "filled" with tooth-colored material to simulate the intended composite resin veneers. The gingival recessions were still evident, and there was no esthetic improvement. (e) The final digital planning with "filled" outlines shows the anticipated white and pink esthetic results.

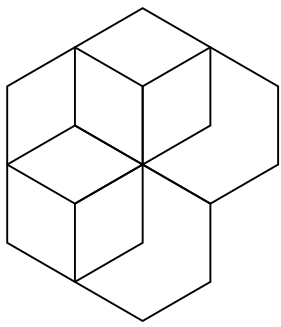
esthetic and symmetrical state. The patient was pleased with that option, but she was cautioned that to maintain periodontal health, she would need to practice optimal home hygiene. She also committed to a regular preventive recall schedule to detect potential problems early.

Previewing the Restorations

The challenge was to plan and deliver a combination of direct-indirect veneers that met the goals of enhanced "white" esthetics for #6 through #11 and enhanced "pink" esthetics for #6, #9, #10, and #11. **Figures 3a through 3e** illustrate the pro-

cess used for esthetic diagnosis, the digital planning principles and tools, a mock-up stage, and fabrication and delivery of the gingineers and regular veneers.

Slide presentation software (Keynote, Apple; Cupertino, CA) was used to provide a preview of the proposed restorations, first with a clear outline and then with a "filled" outline to allow enhanced tooth morphology (i.e., "fuller" teeth) as well as coverage of the recession areas to establish a more harmonious and symmetrical gingival contour. The patient approved the proposed plan without modifications. A physical intraoral mock-up was then created with tooth-colored and



POLYCHROMATIC LAYERS

- Body Enamel
- Value Enamel
- Milky-White Semi-Trans Enamel

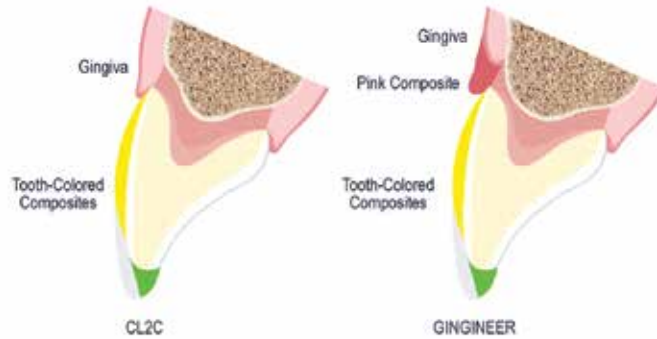


Figure 4: Diagrams depicting a contact lens Type 2C according to the Polychromatic Layering Technique¹⁴ and a gingineer with a modified version of the CL2C.

pink-colored composites to give her a more lifelike preview of the proposed outcome, which she again approved without changes. Based on the approved intraoral mock-up, a silicone matrix was developed and used as a guide to fabricate the individual restorations. Note that the direct-indirect veneers incorporated the pink composite material on the cervical third on #6, #9, #10, and #11.

Restorative Considerations

Because the direct-indirect technique is predicated on the veneer/contact lens being removed from the tooth after light activation, there must be no retentive areas, and all aspects of the tooth must be smooth. This critical step is accomplished by polishing the tooth substrate and applying a hydrosoluble lubricant before placing the composite. In addition, packing a retraction cord is extremely helpful in accurately imprinting the composite margins. Next, as in a direct veneering protocol, the composite layers are applied and light-activated sequentially. However, the final enamel layer should be thicker than is typical to allow the veneer to be removed from the tooth without breaking.

“Another advantage of indirectly bonding the composite veneers is the ability to effect subtle color changes with the luting resin.”

Direct-Indirect Contact Lens

The teeth without gingival recession (#7 and #8) were restored according to a contact lens Type 2C (CL2C) direct-indirect veneering protocol (Fig 4). The CL2C classification refers to a 0.2- to 0.5-mm thick veneer that is primarily used to alter the shape of a tooth and allows for minor chroma and value modifications through association with the colors of the composite and the luting resin. Based on the Polychromatic Layering Technique,¹⁴ a microhybrid milky-white semitranslucent enamel (Vit-I-escence PF, Ultradent; South Jordan, UT) was selected for the incisal augmentation. The facial veneering composites were a body enamel (Estelite Omega EB1, Tokuyama; Encinitas, CA) for the cervical and middle thirds and a value enamel (Estelite Omega MW) for the incisal and middle thirds (Figs 5a-5d).

Tooth-Colored–Gingiva-Colored Composite Interface

The remaining teeth (#6, #9, #10, and #11) were restored with the same technique used for #7 and #8, but with a pink composite to match the soft tissue color. The recreation of a natural transition from the tooth-colored veneering composite to the pink composite required the application and sculpting of the body enamel to a fuller facial contour according to the direct-indirect concept while also creating an ideal thickness and emergence profile at the intended composite-free gingival margin. Next, the body enamel was contoured to create an anatomically correct artificial cemento-enamel junction and light-activated. A pink composite (Gingafill Medium, Cosmedent; Chicago, IL) was selected to best match the soft tissue color. The pink composite was applied approximately 1 mm coronal to the veneering composite margin and conformed to anatomically mimic the free gingival margin of the existing natural dentition. Stratification was completed with a layer of value enamel (Figs 6a-6k).

TIPS

Beginner

- Master the application of a single shade of composite first—leave layering for later. Begin with a single unit.
- Practice obtaining knife-edge margins with finishing discs until they are highly polished.

Intermediate

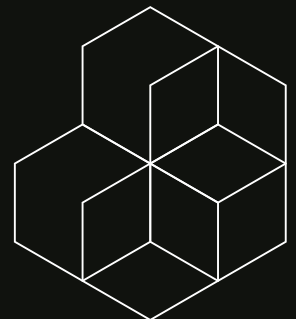
- Practice layering a body and value enamel technique for enhanced esthetics.
- Compare a direct and a direct-indirect veneer side by side to evaluate the margins' quality and ability to modulate the final shade.

Advanced

- Incorporate more complex layering strategies, including the direct-indirect technique.¹⁰
- Challenge yourself and venture into performing multiple units for a complete smile makeover.



Figures 5a-5d: Regular CL2Cs were created with a milky-white semitranslucent enamel, a body enamel, and a value enamel, light-activated, and then finished and polished to ideal contouring and marginal adaptation.





Figures 6a-6k: The gingineers were created by sequential application of the same enamels as the regular CL2C. The body enamel was sculpted cervically to an ideal emergence profile. A pink composite was sculpted to mimic the soft tissue contour of the natural dentition. A value enamel was used to finalize the layering. Proper finishing and polishing procedures helped to ensure an optimal composite–soft tissue interface.

Gingiva-Colored Composite–Soft Tissue Interface

An abrupt, unnatural transition between the soft tissue and the pink restoration is often the cause of esthetic failure in gingival prosthetics/restorations. In the present case, to create a smooth and subtle transition from the pink composite to the natural soft tissue, a gentle overlap of the composite was extended onto the free gingival margin and blended into a feather-edged margin. While this feature allowed for an almost seamless transition, it also raised clinician concerns about the patient's ability to maintain proper home care hygiene. This issue was circumvented with proper extraoral finishing and polishing of the integrative composite–soft tissue zones (pink composite margin, chamfered pink composite, and composite–tooth margin) (Fig 7).

Finishing and Polishing

After the contact lenses and gingineers were removed, they were finished extraorally with aluminum oxide discs to achieve the desired primary anatomy. A key benefit of the direct-indirect technique is that it allows the clinician to create knife-edge veneer margins and polish them to a high smoothness and gloss with discs.^{8,10} Unlike directly bonded veneers, direct-indirect veneers are almost exclusively finished extraorally, enabling better access to the subgingival margins. Properly finished and polished margins help eliminate overhangs and flashes, which are among the leading causes of soft tissue inflammation.

Supplemental Light-Curing and Heat-Tempering

In the direct-indirect technique, the restorations are further light-activated extraorally for 30 to 60 seconds, depending on the irradiance delivered by the curing unit. This step allows for optimal polymer conversion with less risk of overheating the pulp. Finally, the veneers are heat-tempered in an oven at 120°C for 10 minutes or a microwave oven set at 450 W for 3 minutes. The latter approach improves mechanical and optical properties by annealing the monomers and accelerating cross-linking. The immediate benefits from these combined processes are higher flexural strength and wear resistance, lower water sorption, and increased color stability.

Shade Try-In

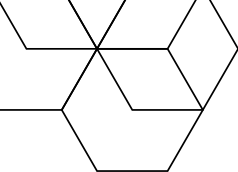
Another advantage of indirectly bonding the composite veneers is the ability to effect subtle color changes with the luting resin. For example, because this patient wanted a brighter smile, the veneers were tried in with neutral and higher value try-in pastes (Insure Light Clear and Opaque White, Cosme-dent) for comparison, and the patient's preferred shade was chosen (Figs 8a & 8b).



Figure 7: To create a smooth and subtle transition from the pink composite to the natural soft tissue, a gentle overlap of the composite was extended onto the free gingival margin and blended into a feather-edged margin.



Figures 8a & 8b: The veneers were tried in with try-in pastes of varying brightness to meet the patient's wish to improve the color of her existing dentition.



Preparing Gingineers for Luting

Next, the veneers' intaglio surfaces were airborne-particle abraded with 30- μ m silicate ceramic (Cojet, 3M; St. Paul, MN), cleaned with 35% phosphoric acid (Ultra-Etch, Ultradent), and immersed in distilled water for 2 minutes in an ultrasonic bath. Following air-drying, a silane coupling agent (RelyX Ceramic Primer, 3M) was applied, followed by the application of a hydrophobic adhesive (OptiBond FL, Kerr; Orange, CA). Finally, the veneers were coated with the chosen luting resin and placed under a light-protective shield (Fig 9).

Luting Protocol

To manage the crevicular fluid and aid in removing excess luting resin during the bonding procedure (Fig 10), a continuous retraction cord (Ultrapak #000, Ultradent) was gently packed into the sulci of all teeth. The NCCLs' sclerotic dentin and the enamel aspects were airborne-particle abraded with 50- μ m aluminum oxide to improve adhesion. Next, selective etching was performed on enamel, followed by the application of a universal single-step self-etch adhesive (All-Bond Universal, Bisco;

Schaumburg, IL) on enamel and dentin. The adhesive was air-thinned and light-activated, and a thin layer of hydrophobic adhesive (OptiBond FL) was evenly applied over the etched and primed aspects. Finally, the veneers were seated, the excess luting resin removed, and the tack cured for 4 seconds with a 2-mm curing tip at 1400 mW/cm² (Valo, Ultradent) to bring the luting resin to a gel state around the margins. The retraction cord was gently gripped at the distal end of #11 and carefully drawn out to remove the remaining semi-soft luting resin from within the intracrevicular areas (Fig 11). The subgingival areas of all the veneers, particularly the gingineers, were carefully inspected for luting resin flash, which was removed with a scaler. The veneers were then light-cured for an additional 20 seconds at 1400 mW/cm² from the facial and lingual aspects.

Anatomical Refinement, Finishing, and Polishing

After the veneers were bonded, the occlusion was adjusted, and minor anatomical changes were made to refine the primary and secondary anatomy. Final polishing was performed with 1- μ m and 0.5- μ m diamond polishing pastes (Diamond Polish



Figure 9: The gingineers were heat-tempered and prepared for luting.



Figure 10: A continuous retraction cord was packed to facilitate the removal of the excess luting resin.



Figure 11: The retraction cord was carefully gripped at the distal end of #11 and drawn out to remove the remaining semi-soft luting resin from within the intracrevicular areas.



Figure 12: Instructions for home care were given, including the proper use of dental floss to ensure a sound composite-pink composite interface.

Mint, Ultradent) and a soft goat hair brush (Brasseler; Savannah, GA), followed by an aluminum oxide paste and a felt disc (Enamelize and FlexiBuff, Cosmedent). Lastly, the patient was given detailed instructions on maintaining good oral hygiene and how to use dental floss effectively at the pink composite–soft tissue interface (Fig 12).

Discussion

The decision-making process for surgical root coverage of NC-CLs must take several factors into account; generally, the most important of these are hypersensitivity and esthetics. Although periodontal soft tissue grafting procedures can often resolve both issues in radicular exposure and cavitation cases, restorative approaches may also be necessary when there are other types of compromised esthetics.

In the present case, the patient adamantly declined an onlay grafting procedure despite its potential benefits, due to the morbidity associated with the transoperative and postoperative stages. As a result, gingiva-colored composites were the only option for resolving the hypersensitive exposed root

surfaces and restoring esthetics. However, simply restoring the pink esthetics would not be enough because the anterior dentition presented additional esthetic deficiencies that could be improved with composite veneering. The solution was to place both tooth-colored and pink-colored composites to recreate the ideal color and morphology for the soft and hard tissue defects. The resulting association led to the authors' development of gingineers, which provide the benefits of the direct-indirect veneering approach, such as better marginal finishing and polishing, as well as improved periodontal health. In addition, this method enables the clinician to have greater control over form during composite sculpting and color modulation with try-in pastes. Furthermore, the pink composite–soft tissue overlap design enabled the restoration–soft tissue transition to be virtually seamless and highly esthetic. Finally, thorough oral hygiene instructions, including the scrupulous use of dental floss, were given; these are critical in determining long-term periodontal health and esthetics, which were assessed at the follow-up appointments (Figs 13a & 13b).



Figures 13a & 13b: The gingineers demonstrated a harmonious esthetic and biologic integration between the composite resin and the soft tissue at the first follow-up visit.



Summary

The esthetic, functional, and biologic resolution of cases that include NCCLs, gingival recession, and deficient restorations on multiple anterior teeth can be challenging. Often, more than one treatment modality—such as soft tissue grafting and direct, indirect, or direct-indirect restorative options—is necessary to address these problems. However, when patients decline surgical intervention, as in the case reported here, the therapeutic options become more limited. The gingineer technique presented by the authors combines the benefits of direct-indirect composite veneers with the use of pink composite resins to achieve a harmonious esthetic result without the need for surgery. It is important to note that this method should be utilized only when patients fully understand that meticulous home care and regular professional hygiene visits are essential to achieve long-term periodontal health.



Dr. Fahl is an adjunct professor of operative dentistry at the University of North Carolina in Chapel Hill. He maintains a private practice in Curitiba, Brazil, focusing on esthetic dentistry.



Dr. Ritter is the dean of the University of Washington School of Dentistry in Seattle.

Disclosures: The authors did not report any disclosures.

References

1. Kassab MM, Cohen RE. The etiology and prevalence of gingival recession. *J Am Dent Assoc.* 2003 Feb;134(2):220-5.
2. Cortellini P, Bissada NF. Mucogingival conditions in the natural dentition: narrative review, case definitions, and diagnostic considerations. *J Periodontol.* 2018 Jun;89 Suppl 1:S204-13.
3. Chan HL, Chun YH, MacEachern M, Oates TW. Does gingival recession require surgical treatment? *Dent Clin North Am.* 2015 Oct;59(4):981-96.
4. Zucchelli G, De Sanctis M. Long-term outcome following treatment of multiple Miller Class I and II recession defects in esthetic areas of the mouth. *J Periodontol.* 2005 Dec;76(12):2286-92.
5. Chu SJ, Mieleszko AJ. Ceramic veneers with gingiva-shaded porcelain to replace lost interdental papillae: a case report. *Compend Contin Educ Dent.* 2017 Jul;38(7):474-80.
6. Hannon SM, Colvin CJ, Zurek DJ. Selective use of gingival-toned ceramics: case reports. *Quintessence Int.* 1994 Apr;25(4):233-8.
7. Viana PC, Correia A, Kovacs Z. The papillary veneers concept: an option for solving compromised dental situations. *J Am Dent Assoc.* 2012 Dec;143(12):1313-6.
8. Fahl N Jr. Direct-indirect Class V restorations: a novel approach for treating noncarious cervical lesions. *J Esthet Restor Dent.* 2015 Sep-Oct;27(5):267-84.
9. Zalkind M, Hochman N. Alternative method of conservative esthetic treatment for gingival recession. *J Prosthet Dent.* 1997 Jun;77(6):561-3.
10. Fahl N Jr, Ritter AV. Composite veneers: the direct-indirect technique. *Batavia (IL): Quintessence Pub.*; 2020.
11. Fahl N Jr. The direct/indirect composite resin veneers: a case report. *Pract Periodontics Aesthet Dent.* 1996;8(7):627-38; quiz 640.
12. Fahl N Jr, Ritter AV. Composite veneers: the direct-indirect technique revisited. *J Esthet Restor Dent.* 2021 Jan;33(1):7-19.
13. Ritter AV, Fahl N Jr, Vargas M, Maia RR. The direct-indirect technique for composite restorations revisited. *Compend Contin Educ Dent.* 2017 Jun;38(6):e9-e12.
14. Fahl N Jr, Denehy GE, Jackson RD. Protocol for predictable restoration of anterior teeth with composite resins. *Pract Periodontics Aesthet Dent.* 1995 Oct;7(8):13-21; quiz 22. **JCD**