

“...artificial gingiva restorations can reduce the necessity of technique-sensitive surgical procedures...”

Prosthetic Gingival Reconstruction in the Fixed Partial Restoration

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Alternatives to restore defective and deficient edentulous spans should include prosthetic gingival restoration as an integral part of an overall esthetic reconstructive option in the decision-making process. To reestablish natural crown ratios and natural gingival profiles in complex cases, artificial gingiva restorations can reduce the necessity of technique-sensitive surgical procedures that depend on the individual pattern of biologic repair, thereby simplifying and reducing the time and cost of treatment.

Aiming to fabricate proportional tooth form and an ideal anatomy without artificial gingiva, the implant team may undertake bone and gingival grafting to try to return vertical volume to the ridge. In many instances, even when the surgical procedures are essentially successful, they may not completely resolve the esthetic dilemma. Even when the height of the ridge is recovered, it can still be very difficult to reestablish optimal papilla form.¹

Historically, prosthetic gingival restoration has been underused in partially edentulous cases. Initial attempts were aimed solely at masking the patient's existing tissue loss without showcasing the artificial gingiva of the restoration because of the obvious esthetic limitations of the prosthetic work executed. When comprehen-

sively understood and correctly planned, artificial gingival restorations can reestablish predictably harmonious anatomy to the lost gingival tissue, reproducing the color, contour, and texture of the patient's gum line.²⁻⁹

Prosthetic gingival restoration requires additional theoretic and technical development of the technician so that he or she can execute these restorations with harmony, balance, and continuity of form between the patient's gum and artificial gum.^{4,5,9,10} The integration of the color of natural and artificial tissue must be planned to minimize the visibility of this junction, restore the asymmetry of the gingival architecture, and replace papilla form.^{4,10-13}

The tissue loss that occurs in cases in which prosthetic gingiva is indicated usually makes it very difficult to create an adequate tooth arrangement and the correct application of the individual anatomy of each tooth without using artificial gum.¹

CASE PRESENTATION

History

The patient presented having had, 10 years prior, osseous and soft-tissue grafts, followed by implant placement (Figure 1) with an alumina crown on tooth No. 9

(Figure 2). She presented with misalignment of the incisal edges and papillae on tooth No. 9 and an altered free gingival margin level (Figure 3). It was suspected that her condition may have been caused by a late growth spurt of the maxillary complex or eruption of the adjacent teeth.

The possible treatment options included: (1) remove the implant, perform bone and soft-tissue grafts, then place a new implant; (2) perform distraction osteogenesis on tooth No. 9; or (3) not perform surgery and instead provide an artificial gingival restoration.

The patient was dental-phobic and traumatized by previous dental experiences and so declined any further surgical intervention. She wanted only a simple reshaping of tooth No. 8 to try to match tooth No. 9, which was shorter. She was educated that this plan would not suffice because the differential in length was too great and that the final result would not be in esthetic harmony. An alternative plan was presented to the patient, which was noninvasive and used artificial gingiva.

Because the defect was just beyond the esthetic zone (ie, the interface between artificial and natural gingiva was beyond the lip perimeter when smiling), the pink composite should be done directly in the mouth, facilitating a better match of color,



Figure 1 Initial placement of ceramic-metal augmented abutment after repeated osseous and connective-tissue grafts of the upper left central incisors. Clinical photograph from 10 years ago.



Figure 2 Placement of an all-ceramic crown showing resultant alteration in tooth form caused by loss of the papillae, ie, long restorative contact point between centrals. Clinical photograph from 10 years ago.



Figure 3 Patient presentation 10 years after the entail grafts and implant placement. The patient presented with a relative change in the position of tooth No. 9. This probably was caused by either a late growth spurt where the maxillary bone and teeth moved incisally while the implant crown stayed in the same position or eruption of the teeth adjacent to tooth No. 9. Notice the decrease in papillae height and the apical position of the gingival margin on tooth No. 9. These factors modified the esthetics of the restoration dramatically.

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Figure 4 Preoperative study model showed all of the esthetic factors.



Figure 5 The diagnostic wax-up restoring the incisal and coronal harmony to tooth No. 9 and redeveloping the laboratory soft-tissue profiles in pink composite (wax also can be used) on the model's restorative gingival interface, ie, the mesial and distal papillae and new level to the free gingival margin.



Figure 6 The original restoration was tapped out and removed.



Figure 7 A full-contour wax-up of the crown was developed over the working model to guide in the design of the final abutment, coping, and restoration.



Figure 8 Pink composite was added to the wax-up, simulating the optimal form of the soft-tissue profiles and relocating the restorative gingival interface coronally.



Figure 9 This pink composite was readily removable so that it could be used as a guide to the ceramic buildup.



Figure 10 A zirconium abutment and crown coping were fabricated.



Figure 11 The ceramic buildup with the pink model composite in position.



Figure 12 The completed composite ceramic crown surrounded by the simulated restorative gingival interface.



Figure 13 The ceramic crown with pink gingival simulation removed the deficiency of soft-tissue, resulting in an untoward esthetic "black triangle" and altering the gingival height.



Figure 14 The subgingival contours of the zirconium abutment were overlaid with pink ceramic.



Figure 15 The zirconium abutment was screwed into position intraorally.



Figure 16 The two-piece abutment and crown in position. Note that the margin of the crown was supragingivally positioned just apical to the level of the adjacent incisor and slightly apical to the level of the potential composite gingival level.



Figure 17 Pink composite was directly bonded intraorally to the abutment, with the crown in position to develop a perfect interface between the pink gingival composite, the crown, and the compromised site.



Figure 18 After removal from the mouth, the pink augmented abutment was finished chairside by removing the excess flash and sharp concavities and polishing the composite. (Finishing can also be performed in the dental laboratory.)



Figure 19 Occlusal view showing the redeveloped gingival profiles recouping the tissue loss.

shape, and texture between natural and artificial gingiva.

The basic requirements for placing pink gingival composite restorations over implants include:

1. No cement line can be placed below the gingiva, which will compromise

the tissue health if the excess cement cannot be removed.

2. The restoration must be retrievable because pink gingival composite may not have the same longevity as ceramics and could require replacement or refinishing in 5 to 15 years.
3. Screw retention of the restoration

should be used to allow for easy retrievability and refinishing, with no cement line below the gingiva.

In this case, the implant was placed 10 years prior on an angulation that did not allow for screw retention of the restoration (the screw exited on the buccal surface

of the crown). Two options to deliver pink gingival esthetics were available:

1. Conventional abutment and a cemented crown with pink gingiva incorporated on the crown. This would create the negative factor of having the actual cement line well



Figure 20 through 22 The restoration was designed to allow the patient to be able to remove plaque and debris accumulating at the soft tissue–restorative interface. Floss must pass readily through the contacts and over the flat or convex apical areas to be able to clean the convex restorative surfaces and passively contact the surface of the remaining soft tissues of the site. Maintenance is key for long-term successful pink restorations.



Figure 24 The crown was cemented in position over the abutment and restorative gingival profile.



Figure 25 The crown was placed secondarily with a retrievable cement to provide for access to the abutment screw if necessary.



Figure 26 and 27 The final re-treatment results, with restored harmony to the smile line and soft-tissue profiles.

below the level of the gingival margin.

2. Separate the gingival from the crown and add it to a screw-retained abutment, and then cement the crown over it. This would bring the cement line coronally toward the gingival margin so as not to compromise the soft tissue.

After choosing the second option, the abutment was prepared and designed to receive the pink gingival composite. The supragingival form of the abutment was visualized in an ideal situation to minimize the adjacent crestal gingiva. When the abutment was placed in the mouth, the finish line of the crown and the restorative gingival interface would be completely supragingival, leaving space beyond it to bond the pink composite apically to the labial and interproximal aspects of the neck of the abutment.

To plan this precise position for the crown margin on the abutment, a full-contour diagnostic wax-up to reproduce the ideal shape of the tooth was developed (Figure 4). This left room apically for the artificial gingiva to be developed. Pink composite was added over the crown

wax-up to reproduce the missing soft tissue (Figure 5). This pink gingival composite mask was removable. The wax-up provided an exact simulation of where to position the ideal crown margin and restorative gingival interface on the abutment to develop a finish line barely subgingival relative to the artificial composite gingiva but supragingival relative to the remaining natural tissue (Figure 6 through Figure 9).

The abutment and coping were fabricated in zirconium (Procera[®], Nobel Biocare USA LLC, Yorba Linda, CA), and the buildup was made with Nobel Rondo[™] Ceramics (Nobel Biocare USA LLC) (Figure 10 through Figure 14). The challenge was matching the adjacent natural teeth. After finishing the buildup, the crown was tried in over the abutment, and then the shape and shade were completed and the crown glazed.

The abutment was prepared to receive the composite. A thin layer of pink ceramic was applied to the abutment as a bonding interface between the zirconium and the composite. Then, the ceramic surface of the abutment was sandblasted, etched, and silanated. Finally, it received a thin layer



Figure 28 Intraoral lateral view of the final restorations—ceramic abutment, composite gingival restoration, and all-ceramic crown.

of flowable pink composite. The abutment was then placed in the mouth (Figure 15). The glazed crown was placed into position on the abutment so that the direct bonding of the gingival composite could be done instantly (Figure 16).

A direct composite technique was executed by adding small increments of pink composite to the abutment, trying to match the color, shape, and form of the natural gingiva (Figure 17). After the pink composite was completed, the crown was removed, and then the abutment with the pink composite attached was unscrewed.

Outside of the mouth, extra pink composite was added to fill in undercuts and voids. Using a thin diamond bur, the edges were shaped and flashed and the excesses were removed. Polishing procedures were performed, followed by glazing of the pink composite (Figure 18). The abutment was then tried in to check the subtle esthetic nuances of the delicate interface between the natural and artificial gingiva (Figure 19). The ability to perform hygiene procedures also was checked, making sure that floss could slide through the entire interface between artificial gingiva, natural gingiva, and adjacent teeth (Figure 20



Figure 23 The “pink” abutment, finished, was torqued to 32 Ncm. Notice the blend between natural tissue and artificial composite gingiva.

through Figure 22). It is essential to ensure that the patient will be able execute all of these hygiene procedures before final torquing of the “pink” abutment into position (Figure 23).

After the abutment was in position, the crown was placed with retrievable cement (Figure 24 through Figure 28). A follow-up appointment was scheduled for 1 month posttreatment to check the health of the gingiva and efficiency of the hygiene procedures executed by the patient.

CONCLUSION

Restoring a defective environment inside the esthetic zone will always be challenging. This article has highlighted a new focus for the implant team called “interface development” which involves the alternative of a composite artificial gingival restorative as a predictable treatment option for fixed partial restorations in these complex esthetic cases. Understanding and deploying this solution involves a new paradigm in thinking for the entire implant team.

The technician should have a wider understanding of both the surgical and clinical procedures to be an active participant on the treatment planning team. Training to reproduce not only the teeth but also gingival esthetics and anatomy are paramount. Currently, with the quality of the available materials (ceramics and composite resin) it is possible to mimic the esthetics of nature, matching teeth and gingiva, while allowing for correct maintenance and long-term life expectancy of the implant bridge.

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