IMPROVING IMPLANT AESTHETICS: PROSTHETICALLY GENERATED PAPILLA THROUGH TISSUE MODELING WITH COMPOSITE

Brian P. LeSage, DDS*

Dental implants provide clinicians with a predictable means of replacing the function of lost natural teeth. Whereas innovative restorative materials and techniques have yielded predictable "white aesthetics" for a tooth, comparable success with the "pink aesthetics" of implant restorations has been more problematic. This article describes a technique for improving the aesthetic outcome of implant dentistry by contouring soft tissue around implants through a buildup of composite to a "UCLA-type" abutment. From this technique, it is believed that a similar procedure for other implant systems can be easily and successfully extrapolated.

Learning Objectives:

This article discusses a technique that allows for implant placement in cases where the emergence profile has been compromised. Upon reading this article, the reader should:

- Understand why the pink aesthetics of the patient's smile are as important as the "white aesthetics."
- Learn how to contour the soft tissues surrounding implants

Key Words: white aesthetics, pink aesthetics, prototype (lollipop), gingival creeping, ideal tissue contouring

*Private practice, Beverly Hills, CA; Course Director, UCLA Aesthetic Continuum, UCLA Dental School, Los Angeles, CA.

Brian P. LeSage, DDS, 436 N. Roxbury Drive, Suite 100, Beverly Hills, CA 90210
Tel: 310-276-2468 • E-mail: Brian@cosmetic-dentistry.com

Dental implants are well-established as a predictable treatment modality for replacing the function of lost or missing natural teeth. Improved restorative materials and techniques have also brought a high level of quality and predictability to the "white aesthetics" of the tooth. Comparable success with the "pink aesthetics" of an implant restoration, however, has proven to be more problematic. When the quantity, quality, contour, and/or form of keratinized tissue surrounding dental implants is inadequate, the result too often is new teeth that are beautiful in color, but emerge from a less than favorable tissue contour and have length-to-width ratios and contact/connector issues that are unaesthetic.

This article will describe a restorative technique for improving the aesthetic outcome of implant dentistry by contouring soft tissue around implants through a patient, progressive buildup of a composite to a standard "UCLA-type" abutment. From this well-documented technique, it is believed that a similar procedure for other implant systems can be easily and successfully extrapolated.

Background and Protocol

In the 1990s, a number of developments improved the aesthetics of implant therapy. Better restorative materials made the replication of natural tooth morphology and color more attainable. At the same time, hard and soft tissue graft materials and techniques,[1-9] membrane techniques,[10-13] and other restorative procedures[14-18] enabled clinicians to place implants in optimal positions close to the missing tooth root. With enhanced implant placement, more ideal emergence profiles were made possible, and implant restorations became more lifelike.[19-24] Nonetheless, implant clinicians continued to struggle to provide soft tissue topography, contour, and form that met restorative ideals. The spotlight has finally turned to the pink aesthetics and to the biological considerations of tissue at the implant site.

The tissue contour technique illustrated herein was developed by the author to help the implant team (ie, the surgeon) maximize the quantity of attached gingiva and to provide gingival scallop, zenith, and emergence profile mimicking tissue around the extracted tooth and the adjacent teeth. Termed the "lollipop" technique for the shape of the provisional restoration, the clinical protocol progressively nurtures development of keratinized

Figure 1. Preoperative view of gingival biotype and architecture. Note apical extent of laterals verses centrals and asymmetry present.

Figure 2. Initial placement of the lollipop prototype to implant fixture.

Figure 3. Deficient papillae formation is evident in view of the lollipop approximately 2 weeks after insertion.

Figure 4A. The composite lollipop prototype prior to modification. 4B. The prototype following modification.

Figure 5. View of the gingival tissue shows black triangles on mesial and distal aspects after initial modification of the prototype.

Figure 6. Final lollipop exhibits proper adaptation, correct emergence profile, and elimination of the black triangle.

tissue at the implant site with the use of a composite "prototype" characterized by a very narrow neck.

The ideal clinical strategy for optimizing pink aesthetics begins with the clinician's preservation of soft tissue at the time of extraction. After implant placement, the surgeon picks up the fixture with the aid of the surgical template and acrylic resin (ie, Duralay, Reliance Dental Manufacturing Co, Alsip, IL) and transfers the implant impression coping to a model. The prototype is fabricated in the laboratory with the application of composite materials to a plastic or metal opaque UCLA-type abutment. Connection to the implant occurs as early as the day of second-stage surgery and up to 2 weeks after uncovering. Experience of the surgical team, timing, and convenience of office schedules help determine this appointment. When considering this technique in the immediate loading case, Glauser has shown that the stabilization of the implant is at its weakest point during the period 2 to 4 weeks postoperative.[25] Following placement of the prototype, the patient is recalled at routine intervals for assessment of gingival movement and progressive enlargement and contouring of the prototype neck with composite as tissue moves into the gingival embrasure space.

During the author's early cases utilizing the protocol, patients were scheduled for office visits every 3 weeks, the prototype was observed and/or removed at each appointment, and additional composite was applied to the neck of the restoration at most visits. Subsequent to developing the technique, Abrahamsson reported that there is an increased risk of tissue moving apically with frequent removal of a prototype from the fixture.[26,27] Although the author had not encountered this problem in his early trials of the technique, the protocol was modified to eliminate any risk of inhibiting tissue development with frequent removal of the prototype restoration. Patients now are appointed every 4 to 8 weeks and the prototype is removed only when incisal creeping of gingival papillae is observed. Tissue is allowed to fill in and is then pushed from the lingual toward the facial to create the papillae.

During this process, extreme care is taken whenever material is added to the buccal aspect. If tissue is already on the implant tooth at the desired height, it is inadvisable to push more tissue on the direct facial because asymmetry can result with the contralateral tooth. Even

Figure 7. View of the definitive restoration two years postoperatively demonstrates natural gingival architecture and zenith.

Figure 8. View of definitive restorations at 51 months reveals the stability that can be attained in the gingival complex over the long-term.

without pushing, the gingiva will continue to move down naturally to the point of biological consideration,[28-30] making it possible to build out the emergence profile somewhat more in the future if necessary. Should the surrounding tissue blanch for more than one minute after the prototype is replaced, the author has found the blanching indicates that the tissue has been overstressed. When this occurs, the prototype should be removed and the newly added composite trimmed back to relieve the tissue. While the tissue is being sculpted, the author recommends gentle but very thorough brushing only. Most interproximal aids (eg, floss, interproximal brushes, toothpick) will put apical pressure on the tissue and inhibit its ability to creep more coronally to fill the intentionally retained black triangles. Once the prototype is contoured fully and no black triangles exist, the tissue contour should be picked up in the final impression. The definitive restoration mimics the prototype in aesthetics, function, biology, and phonetics, and it can then be maintained with normal brushing and flossing.

Once the papillae are well-established in optimal contour, scallop, and level relative to adjacent teeth, a precise technique is used to transfer the properly developed emergence profile impression without collapsing the tissue. Definitive restorations are then fabricated, tried in, and confirmed radiographically to be seated properly; restorations are then evaluated for parameters of white, pink, and black aesthetics, and delivered with the patient's approval.

Three to 4 months of tissue contouring and development followed by 3 to 4 months of "creeping" and stabilization are normally required for ideal tissue contouring

Figure 9. Postoperative radiograph of definitive restoration at 48 months.

Figure 10. After 48 months postoperation, the papillae heights on the mesial and distal aspects of the lateral incisors are at matching heights.

utilizing the lollipop protocol. It is important that patients be advised during treatment planning that a minimum of 1 year is required for treatment from implant placement to definitive restoration. At the same time, patients need to be thoroughly reassured that they will never be

Figure 11. Facial view of patient's smile prior to extraction of tooth #8(11).

Figure 12. The lollipop prototype in place, replacing the extracted tooth. Patient decided to whiten her teeth after prototype was fabricated and accepted color discrepancy.

Figure 13. Facial view at 2 months reveals improved gingival architecture.

without a tooth replacement during the treatment period. A fee that recognizes the duration of treatment and the frequency of clinical visits during the restorative stage is developed and also communicated to the patient during discussion of the treatment plan.

Figure 14. Prototype with modifications only supragingivally to aid with biological creeping to the desired gingival and papilla formation.

Case Presentations

Case 1

A 57-year-old female patient presented with a fractured tooth #7(12) that had previously been endodontically treated (Figure 1). The tooth was removed by the periodontist, and a 3.3-mm x 15-mm standard implant (ie, NP Brånemark, Nobel Biocare, Yorba Linda, CA) was placed. At the same time, a connective tissue graft was performed to maximize the available soft tissue during healing (Figures 2 and 3). Tissue grafting was not a requirement for success using the lollipop protocol, but may be used selectively when existing tissue quantity is deemed less than adequate for the desired outcome. After 6 months of healing, the implant was uncovered, additional tissue was grafted at the implant site, and the lollipop prototype was attached (Figures 4 and 5). Although the coronal aspect of the restoration completely filled the space supragingivally, the narrow neck of the prototype left ample black space into which the tissue could be manipulated, shaped, and contoured to optimize aesthetics. There was no buccolingual cantilever with this prototype. The prototype filled the entire coronal aspect of the missing tooth and, in doing so, was used to evaluate aesthetics, function, and phonetics. As the prototype was not wider buccolingually, there was no more cantilever than exists with the natural tooth. Additionally, ideal positioning of the implant allowed for lingual screw access through the cingulum.

Since the patient was employed in the author's dental office, she was recalled more frequently than is typical for contouring the tissue to the desired aesthetic

and biologic outcome. After placement of the prototype, the patient was seen every 3 weeks for the first 3 months. Composite was added at most visits. Between 3 and 6 months, the site was observed without further enlargement of the prototype to allow tissue to continue moving coronally. The papillae were allowed to mature biologically to fill the space and to develop scaffolding around the prototype (Figures 6 and 7). A metal UCLA standard abutment was used because the gingival biotype was of adequate thickness and form and because it improved the match to the contralateral existing porcelain-fused-to-metal restoration on tooth #10(22), which had a gold-cast post and core. The result was a restoration in which the quality of the pink aesthetics enhanced the quality of the white aesthetics (Figures 8 through 10).

Case 2

A 25-year-old woman presented with tooth #8(11) having been severely compromised by root resorption (Figure 11). Although preservation of the natural tooth is a priority in a patient of this age, a clinical team that included a periodontist and an endodontist concluded that salvaging the tooth would create defects that likely would compromise adjacent teeth #7(12) and #9(21). The tooth was extracted and a 4.3-mm x 15-mm standard implant (ie, NP Brånemark, Nobel Biocare, Yorba Linda, CA) was placed.

At uncovering, a lollipop prototype was connected to the implant (Figure 12). During the ensuing 4 months, the prototype was removed four times and composite was added on each occasion (Figures 13 through 15). For the subsequent 3 months, the papillae were allowed to mature and stabilize. Because available soft tissue was adequate for a correct soft tissue profile, no grafting was performed in this case. Since the gingival biotype was thin and scalloped, however, an abutment (ie, Procera, Nobel Biocare, Yorba Linda, CA) with a pressed ceramic crown (ie, IPS Empress, Ivoclar Vivadent, Amherst, NY) was used. Again, the resulting restoration was one in which the quality of the pink aesthetics enhanced the quality of the white aesthetics (Figures 16 through 18). While this technique can be performed with success and predictability, similar results can now be achieved through the use of milled abutments, where one can scan the prototype and precisely reproduce the abutment three dimensionally.

Figure 15. View of lollipop reveals minimal transtissue modification 1 month following the prior composite contour change.

Figure 16. Radiograph reveals typical bone loss to first tread and nice adaptation of abutment/crown complex to fixture.

Conclusion

Natural soft tissue aesthetics are equally as important as the contour and color of the restoration in providing aesthetic, long-term, comprehensive care of the dental implant patient. The use of a narrow-neck prototype that is progressively and patiently widened during an extended period following second-stage implant surgery promotes the development of adequate attached gingiva for ideal implant aesthetics. Named for the prototype itself, this lollipop technique can be utilized with all commercial implant systems and with angled or one-piece abutments. The lollipop technique provides a prosthetic means of predictably achieving desirable white and pink aesthetic outcomes in implant therapy. No contraindications for its use have been identified.

Figure 17. Nearly ideal gingival contour, zenith, and papilla formation architecture can be seen.

Figure 18. Sagittal view of the definitive restoration.

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Continuing Education (CE) Exercise No. 9

To submit your CE Exercise answers, please use the answer sheet found within the CE Editorial Section of this issue and complete as follows: 1) Identify the article; 2) Place an X in the appropriate box for each question of each exercise; 3) Clip answer sheet from the page and mail it to the CE Department at Montage Media Corporation. For further instructions, please refer to the CE Editorial Section.

The 10 multiple-choice questions for this Continuing Education (CE) exercise are based on the article "Improving implant aesthetics: Prosthetically generated papilla through tissue modeling with composite," by Brian P. LeSage, DDS. This article is on Pages 257-263.

1. What is the name of the technique where the clinician progressively adds composite to a "UCLA-type" abutment over a period of months?
a. Lollipop technique.
b. Immediate loading technique.
c. Progressive loading technique.
d. Composite pressure technique.

2. On average, how much time is needed to prosthetically generate a papilla?
a. Two to three months.
b. Three to four months.
c. Six to eight months.
d. Ten to twelve months.

3. Pink aesthetics around implants is best accomplished when which of the following item(s) are maximized?
a. Quality of gingival tissue.
b. Form of keratinized tissue.
c. Quantity of gingival tissue.
d. All of the above.

4. According to Glauser, the stabilization of the implant is at its weakest point during which of the following periods?
a. Up to 2 weeks.
b. At 2 to 4 weeks.
c. At 6 to 8 weeks.
d. None of the above.

5. Prior to capturing the properly developed emergence profile in the precise final impression, the clinician must have established which of the following?
a. Scallop/Zenith.
b. Optimal contour.
c. Relatively level with the adjacent tooth.
d. All of the above

6. When using this technique, for how many minutes can a tissue blanch before it is considered overstressed?
a. One.
b. Two.
c. Three.
d. Four.

7. Extreme care must be taken when material is added to which surface, especially if the tissue is already symmetrical with the contralateral tooth?
a. Distal.
b. Mesial.
c. Buccal.
d. Lingual.

8. How many month(s) of tissue contouring and development will this technique average?
a. Two.
b. Three to four.
c. Four to six.
d. Five.

9. How many months of creeping and stabilization will this technique average?
a. One to two.
b. Two to three.
c. Three to four.
d. Four to five.

10. As specifically described in the article, which aspect of the lollipop prototype initially must completely fill the space supragingivally?
a. Distal.
b. Mesial.
c. Coronal.
d. Lingual.