A Simplified Technique for Creating a Customized Gingival Emergence Profile for Implant-Supported Crowns

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Abstract

A successful implant restoration is one that will allow adequate function and esthetics. Soft-tissue management around implant-supported restorations continues to present a considerable challenge for the restoring dentist as well as the laboratory technician while fabricating the final prosthesis. This article presents a simplified and economical technique to direct gingival tissue healing, as well as create a removable gingival replica of the customized gingival emergence profile. The created profile can then be used in the dental laboratory to achieve a superior and predictable esthetic outcome for implant-supported fixed restorations.

The ultimate goal of implant prosthodontics is to restore function and esthetics. A major challenge for satisfying the esthetic component is soft-tissue management around the implant, whether at the time of surgical placement, at the uncovering stage, or right before impression making. To be considered successful, a dental implant should allow the placement of a restoration that provides an adequate esthetic appearance.[1]

The main aim of the two-stage implant surgery procedure, as outlined by Brånemark, is to allow the bone to heal and remodel around the implant by covering the implant for 3 to 6 months.[2] Once the initial healing period has occurred, osseointegration then depends on proper prosthetic design, regular hygiene, and maintenance of the implant and prosthesis.[3] It is universally accepted that optimal tooth position for implant restorations should be identified before surgical implant placement.[4,5] Single-tooth fixed restorations have been reported to have the highest rate of success compared to other treatment options,[6-13] and despite all the technical difficulties, anterior single-tooth implants are the modality of choice for replacement of missing anterior maxillary teeth.[13]

The prosthetic-dependent nature of dental implant treatment and the need for optimum emergence profile at the implant gingival level has led to the development of alternative implant abutment diameters and contours.[14-16] The patient's objective of treatment is not implant placement per se, but rather a functional and esthetic restoration.[17] It is therefore critical that a customized interim restoration be initially placed, allowing the tissues to heal conforming to the exact cervical contour and emergence profile of the planned definitive restoration.[18,19]

The emergence profile is defined as that portion of the tooth contour that extends from the base of the gingival sulcus past the free gingival margin to the height of contour facially and lingually and to the contact areas proximally.[20] Human teeth, in general, have straight emergence profiles in the gingival one-third, which help promote gingival health and prevent plaque retention.[20-22] Alterations in natural tooth contour have been shown to negatively effect gingival health.[23,24]

The suprabony connective tissue surrounding the implant is made up of circumferential fibers that run parallel to the implant surface.[25,26] Similar to teeth, soft tissues surrounding implants form an epithelial attachment, a sulcular epithelium, and may also have masticatory mucosa.[27] The cellular response of the soft-tissue cuff surrounding dental implants is similar to that of natural teeth except for the lack of periodontal ligaments.[28] It has long been proven that epithelial cells form a tight collar around titanium implants without signs of inflammation.[28-30] The use of a healing abutment wider than the implant diameter is encouraged for at least a couple of reasons: (1) The periimplant mucosal tissues will heal with a larger diameter, providing less risk for entrapment of soft tissues between the final abutment and the implant body and (2) Subgingival abutment preparation, cord placement, impressions, and development of emergence profile are all better facilitated.[31]

The objective of this article is to describe an easy and economical technique to create a removable gingival replica of a customized gingival emergence profile that can be used in the laboratory to maximize the esthetic outcome of implant-supported fixed restorations.

Figure 1 Diagnostic waxing for missing tooth.

Figure 3 Primary stone cast of healed gingival tissues.

Technique

1. A diagnostic waxing is made for the tooth to be restored (Fig 1) and is duplicated in stone to allow fabrication of a vacuum-formed matrix (Temporary Splint Material, 5 × 5 in, 0.02-inch thick sheets, Patterson Dental, St. Paul, MN), which will be used to guide implant placement and later to fabricate an interim crown.
2. After initial healing of gingival tissues, the healing abutment is removed (Fig 2), and an impression of the resultant tissue contour is made using an implant pick-up impression coping. The impression is then poured in stone after securing the implant analog.
3. On the resultant stone cast (Fig 3), the inner gingival sulcus is reshaped by a rotary instrument and slightly expanded to approach the final desired crown contour. A temporary implant abutment dowel is then adjusted for height (using the previously fabricated vacuum-formed matrix) and is screwed to the implant analog for fabrication of an interim crown. Care should be taken to block the occlusal orifice of the temporary dowel so resin will not flow into it. The inner stone gingival sulcus surfaces are lubricated with petroleum jelly (Cumberland Swan, Smyrna, TN), and an interim crown is fabricated with tooth-colored autopolymerizing resin, Jet acrylic (Lang Dental Manufacturing Co., Inc., Wheeling, IL) using the vacuum-formed crown matrix (Fig 4). The resin is then polished, and the interim crown is screwed into the patient's mouth. The occlusal access is sealed with a suitable temporary filling material.
4. After a period of about 1 week, the interim crown is unscrewed, cleaned, and roughened externally to allow adding more resin onto the external gingival contours, building it gradually to the desired final contour. This process will naturally stretch the gingival tissues, and should be done in increments over a period of time, preferably 1 week apart to allow for tissue accommodation without an inflammatory response. Each time, the resin is polished and screwed back in place.
5. Once the desired gingival sulcular and emergence profile contour is achieved (Fig 5), a final impression is made of the customized gingival sulcus. This time, the impression is poured in stone to form a master cast with a *"removable gingival replica"* of the customized gingival emergence profile. This is fabricated by first securing the implant

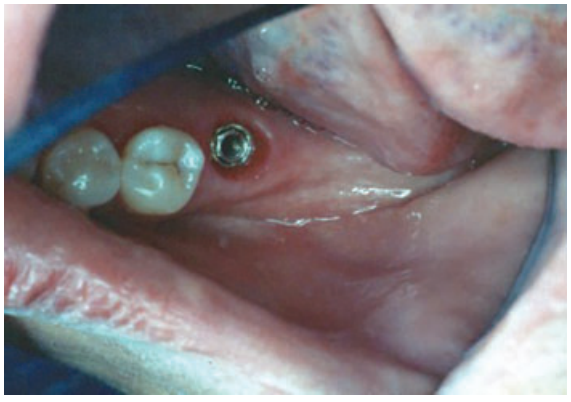

Figure 2 Initial tissue healing around healing abutment.

Figure 4 Provisional crown is fabricated onto altered sulcus contours.

Figure 5 Final shape of customized gingival sulcus.

analog to the impression coping, then injecting a rubber gingival replication material, such as Gingitech (Ivoclar Vivadent, Schaan, Lichtenstein) into the final impression (Fig 6). Care should be taken to cover about 5.0 mm apical to the implant analog platform. After polymerization, the material is removed and trimmed with a sharp scalpel to form a flat base parallel to the occlusal surface and flat mesial and distal surfaces that are convergent occlusally to provide retentive undercuts on the stone cast (Fig 7).

6. The resultant *"removable gingival replica"* is placed back into the impression (Fig 8), which is subsequently poured in stone to form the master cast. The customized gingival replica can then be easily removed by pinching in a mesiodistal direction and placed back as desired, fitting exactly in its respective place on the stone cast via retentive undercuts (Fig 9). The same implant analog can be retrieved from the initial cast and reused to form the master cast.
7. This technique allows easy and unobstructed access to the cervical contour of the final crown restoration as it is being fabricated (Fig 10), which is harmonious with the customized gingival emergence profile of the patient, by virtue of perfect adaption to the removable gingival replica.

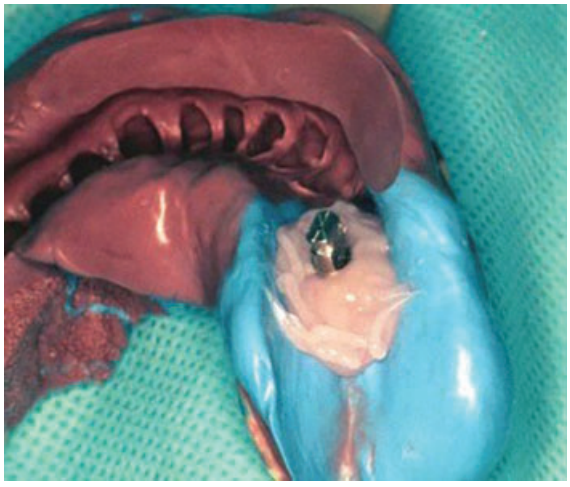

Figure 6 Gingitech rubber material is injected around implant analog into the final impression.

Figure 7 Removable gingival replica is trimmed to form a flat base with occlusally convergent mesial and distal surfaces.

Discussion

A well-adapted interim restoration shaped to the optimum form of the definitive restoration is necessary to develop the restorative gingival contours in the prospective recipient site.[18] The described technique will permit the dental laboratory to fabricate a customized implant abutment with optimum crown margin location relative to the patient's newly formed gingival margin (Fig 11). This will allow the crown margin, finish line, and contours to fit as planned, and to support the custom-formed gingival contours for superior esthetic results (Fig 12).

The transfer of information to the laboratory is critical to achieve a successful esthetic outcome. Previous authors have

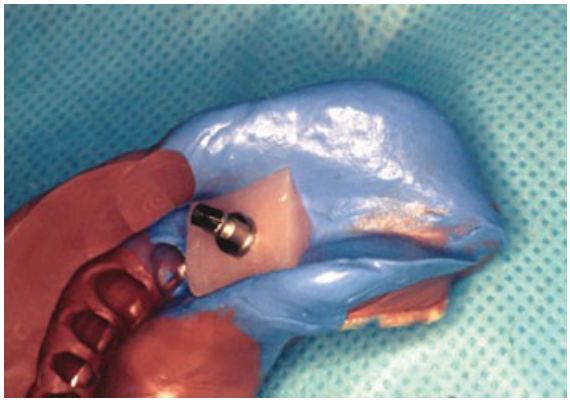

Figure 8 Removable gingival replica is placed back into the impression before pouring in stone.

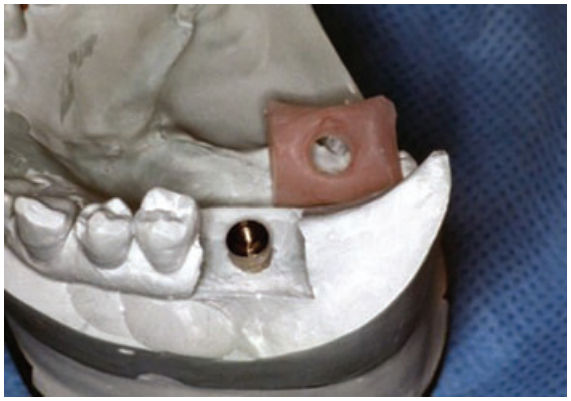

Figure 9 Customized gingival replica can be removed by pinching mesiodistally to release from stone undercut.

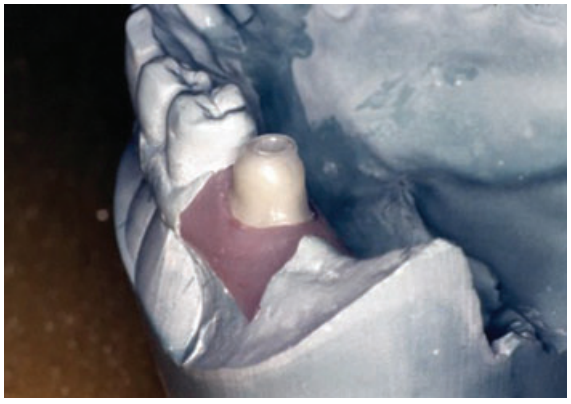

Figure 10 Custom abutment is waxed to customized gingival contours.

described a technique whereby a final impression is made of the customized interim restoration itself, which is then placed back into the impression together with the implant analog before pouring the working cast.[7] A major disadvantage of this procedure is that the patient has to wait to receive the interim restoration after the cast is separated from the impression. In

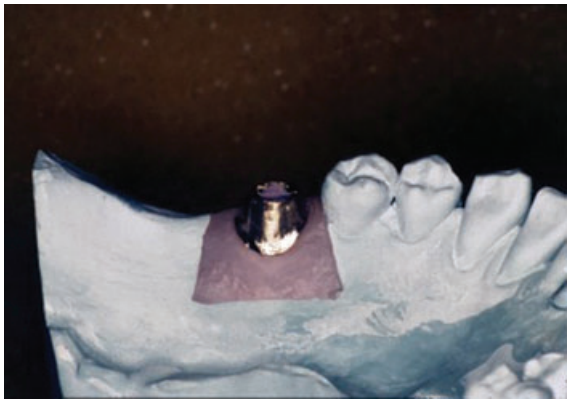

Figure 11 Customized gold abutment contours and crown margins are checked against the customized gingival contours.

Figure 12 Custom abutment and crown are delivered at same visit, providing superior esthetic results.

the described technique, however, the patient receives the interim restoration immediately, eliminating chairtime, because most procedures are done in the laboratory.

Other authors have described a technique whereby the gingival sulcus around the implant is selectively scraped on the stone master cast using a scalpel to simulate the desired gingival margin. The definitive crown is then fabricated and provisionally luted to the implant abutment displacing the soft tissues. After about a week, when the tissues have settled in, the crown is then removed and permanently cemented.[32] Because no attempt was made to contour the soft tissues prior to fabrication of the master cast, fabrication of the definitive crown contours becomes very subjective, as the dental laboratory technician has no real reference to the patient's emergence profile to fabricate the crown contours against, except for a manually contoured cast. The authors rightfully admit that the excessive soft tissue present clinically prevented complete seating of the definitive metal-ceramic crown, causing tissue blanching. They, therefore, had to cement it with a provisional luting agent and wait for some time until the tissues adapted to the new crown contours before permanent cementation. This technique appears to be very risky regarding gingival tissue health and recovery adaptability, and additionally risks fracturing the definitive metal-ceramic crown while attempting to remove it prior to permanent cementation.

The current technique effectively addresses these concerns because it provides controlled and predictable soft-tissue contouring throughout the interim healing phase. Additionally, the contoured tissue information can be transferred to the dental laboratory via the *"removable gingival replica,"* which will enable the dental technician to accurately fabricate the definitive crown with controlled emergence profile. Also, there is no need to provisionally cement the definitive restoration and risk its fracture upon removal.

Furthermore, the current technique allows the laboratory to fabricate the custom abutment and the definitive crown restoration as one step for cement-retained crowns, so they can be screwed in and cemented at the same visit. This eliminates the

need to impress the customized abutment separately. Similarly, screw-retained crowns are more easily fabricated using this technique. A further advantage of this technique is that direct tissue contact with resin while being added for sulcus modification is minimized, because the modified interim crown is only screwed in after being completely polymerized and polished extraorally.

Summary

This article describes a simplified technique that can help dentists as well as technicians achieve superior esthetic and functional results with implant-supported crown restorations. This technique offers a very predictable and economical approach to address the challenge of creating a customized gingival emergence profile, particularly in the esthetic zone.

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