MANAGING THE PERIIMPLANT MUCOSA:

— A clinically reliable method for optimizing soft-tissue contours and the emergence profile

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Introduction

Distinctive characteristics of the peri-implant mucosa differentiate it from periodontal tissue. The difference lies in the absence of cementum. In fact, the collagen bands lie differently at the site of the implant. The fibers are set in the periosseum at bone crest level and spread parallel to the implant surface, or they align in broad bands that, in more distant areas, expand almost perpendicular to the implant surface. These horizontal fibers seem to bend vertically and appear to run parallel to the implant’s surface in the areas nearest to the implant. The connective tissue at the implant interface contains a larger amount of collagen, but fewer fibroblasts and vascular structures, than the tissue adjacent to natural tooth structure.

The successful restoration of lost teeth in the anterior region of the mouth has to meet both esthetic and functional parameters. In addition to the correct placement of the implant fixture, it is essential to achieve a soft-tissue morphology that is as physiologically realistic as possible. An impression obtained with standard copings enables the 3-D position of the implant fixture to be reproduced on a laboratory model. However, the reproducibility of the periimplant soft tissue is often difficult to control, and this can compromise esthetics in the final implant restoration. Most healing abutments have a cylindrical shape, which is not suitable to reproduce correctly the emerging profile of the natural teeth. The dental technician can model an implant-supported prosthesis with a cylindrical profile or with a more appropriate esthetic profile based only on an assumption of the shape suited to the clinical situation. In fact, final tissue heights of the papillae and buccal gingival margins, relative to their pre-implant position, are ultimately dictated by the post-healing levels and position of the interproximal and facial bone.

Because of its characteristics, the periimplant mucosa can be modified by a sculpting process based on the principle that soft tissue becomes modifiable after controlled, constant compression. Especially in patients with a thick gingival biotype, this tissue can be manipulated to reproduce the normal scalloped, parabolic gingival contours. Different approaches have been suggested by the current literature on soft-tissue profiling. All of these focus on establishing a contour of the provisional prosthesis that is as accurate and stable as possible so that it can be faithfully reproduced in the definitive prosthesis.

The present paper describes a method that has been consolidated over several years of clinical practice for the periimplant soft-tissue profiling in the anterior areas. By following the procedure described in the next section, it is possible to recreate, in cooperation with the dental technician, the correct emergence profile for both single and multiunit prostheses.
Clinical procedures

This prosthetic procedure is to be used after the healing of the periimplant soft-tissue by means of standard healing abutments so that a round shape of the periimplant mucosa can be achieved. An impression can then be obtained by screwing the standard pickup coping to the fixture. A polyether (Impregum, 3M ESPE) material can be used for the impression in order to provide a provisional screw-retained prosthesis (Fig. 1).

This provisional restoration is provided to create and condition the periimplant soft-tissue contours, thus reproducing the physiological scalloped, parabolic appearance and the tropism of the adjacent gingiva. The resin provisional prosthesis is kept in the oral cavity for a period of three to six months to ensure a stable outcome of the periimplant soft-tissue conditioning process. During this period, the patient should be followed monthly and the clinician should adapt the provisional prosthesis by adding or removing small amounts of resin as necessary in order to obtain the required shape for the gingival contours and the appropriate emergence profile. This conditioning process has to be carried out gradually to avoid excessive compression, which would cause unacceptable discomfort for the patient.

Once the required gingival morphology has been achieved (Fig. 2), the procedures for providing the definitive restoration can be carried out. The implant analogue is embedded into laboratory stone (or plaster) in a mixing cup and allowed to set. This

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**Fig. 1**
A screw-retained provisional restoration.

**Fig. 2**
The soft-tissue aspect after conditioning with provisional crowns.

**Figs. 3a–d**
The provisional restoration is unscrewed from the oral cavity, screwed to a laboratory implant analogue and embedded in casting material (a). Polyether material poured at the level of the prosthetic emergence profile and surrounding provisional crown (b). Removal of the Provisional (c). A conventional impression coping screwed on (g), (d). Note the gap between the standard coping and impression material.
procedure can be done prior to the clinical appointment to save chair time. At the time of the clinical appointment, the provisional restoration is removed from the oral cavity and screwed to the implant analogue. A polyether material is then placed into the mixing cup (Fig. 3a) so that the provisional restoration is put into the impression material at the level of the prosthetic emergence profile (Fig. 3b). This generates a static reproduction of the soft tissue and in particular of the subgingival portion of the provisional prosthesis. After polymerization of the polyether, the provisional restoration is unscrewed (Fig. 3c) from the implant analogue and replaced, in the same supporting cup, with the stock hexed transfer coping for the final impression. A space is thus created between the polyether material and the impression transfer coping (Fig. 3d); this space reproduces the morphology of the periimplant soft tissue. Such procedures are more suitable for screw-retained provisional restorations because of the simple removal of the provisional prosthesis from the implant analogue in the mixing cup.

Next, cold self-curing resin (TEMP RED, Micerium) is poured into this gap and left to set (Fig. 4a). A custom transfer coping for this single implant site is thus obtained (Fig. 4b). This modified transfer coping is then removed and screwed on to the implant in the oral cavity (Fig. 4c). The resulting device is an exact periimplant soft-tissue replica and fits perfectly to the shape of the marginal mucosa after the soft-tissue conditioning. No compressive effect on the mucosa or impression material gaps are generated by the rigid resin around the transfer coping as sometimes occurs with the silicone or polyether materials commonly used for precision impressions. A conventional impression can then be taken. By means of a custom impression device, a definitive impression is obtained, so the customized transfer coping with the resin remains embedded in the impression material on the device (Fig. 4d). Finally, a CAD/CAM abutment can be provided to reproduce the emergence profile obtained with the provisional prosthesis. The definitive restoration will be put into position and naturally follow the scalloped periimplant marginal mucosa (Fig. 5a). A stable outcome can be achieved because of the absence of any soft-tissue compression (Fig. 5b). This method may be used for the restoration of both single and multiple gaps (Fig. 6).

Discussion

An emergence profile that mimics the natural tooth should be obtained for successful esthetic implant restoration. Moreover, it allows proper hygiene, which is fundamental for implant maintenance. The best way to achieve the correct emergence profile is to sculpt the periimplant mucosa by means of a provisional prosthesis. Only the thick gingival biotype can be manipulated, as postulated by Berglundh et al. and Simeone et al. In fact, the thin gingival biotype is not

Figs. 4a–d
Acrylic resin poured into the gap (a). The customized impression coping obtained after resin polymerization (b). The customized coping screwed to the implant maintains the conditioned esthetic contour (c). The customized coping in the definitive impression (d).
suitable for sculpting because its compression does not lead to a controlled scalloping, but to a high risk of soft-tissue collapse and gingival recession.7

Standard healing abutments and transfer copings do not simulate the cross-section of natural teeth4 because they are round. Many authors agree that the final prosthetic rehabilitation must match the intraorally obtained soft-tissue modifications.5, 9–11 Prefabricated provisional crowns cannot mimic the complexity and the variations of human soft tissue. Therefore, only a chairside modification of the provisional restoration can accomplish the optimal result. Moreover, the same authors agree that provisional restoration has to be screw-retained to prevent the irritating side effects of provisional cement on the periimplant soft tissue, especially in situations in which frequent removals of the provisional restoration are required. In addition, crucial for achieving a successful esthetic outcome is the transfer of the impression information to the dental laboratory.12 The operator should choose an easy and reproducible technique to transfer the emergence profile to the impression and therefore the model cast in order to allow the dental technician to create a suitable contour for the best esthetic outcome of the final restoration.

The self-curing resin used for contouring the impression coping is common in the dental practice; moreover, it is easy to manipulate and inexpensive. It can be easily poured into the gap between the coping and impression material as long as it is fluid. Because of its low shrinkage, the modified impression coping accurately reproduces the soft-tissue contour obtained with the provisional restoration. Consequently, the exact shape of the resin-generated emergence profile will be transferred to the definitive restoration. Another important advantage of this technique is that the patient is not left without the prosthesis for a long period during the definitive impression procedures; in fact, the customized transfer coping can support the periimplant mucosa. Tissue collapse and volumetric changes will be avoided and the soft-tissue sculpting will remain stable. Furthermore, the technique presented is easily reproducible and does not require particular operator skills.

Conclusion

In highly demanding areas, where a good esthetic outcome is as essential as the function of the implant-supported restoration, soft tissue can be modified to obtain an optimal emergence profile and gingival contours with a physiological appearance as realistic as possible. The method described allows for faithful reproduction of the conditioned soft tissue when the final impression is taken; thus, its reproduction on the definitive restoration is possible. The main advantage of this approach is the easy and reproducible use of an inexpensive material that is easily available to clinicians.

Editorial note: A list of references is available from the publisher. This article was first published in the Journal of Esthetic and Restorative Dentistry (Vol. 25, No. 5, 2013, 317–23).