



Preoperative Gingival Conditioning as a Guide for Implant Installation and to achieve Proper Dentogingival Contours

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ABSTRACT

A successful esthetic outcome for implant-supported dentures depends on the careful manipulation of peri-implant tissue as well as the precise placement of the implant. In addition, careful surgical and prosthetic planning is essential for esthetically important areas, especially in partially edentulous cases. This study describes a clinical case that presented absent maxillary central incisors in which prior prosthetic planning was used to perform provisional restorations, that was used to condition the gingival tissues and guide implant installation. These procedures made it possible to achieve a dentogingival contour, interdental papillae, and an emergence profile in the edentulous area. The techniques outlined here proved to be sufficient and support the peri-implant tissues to create a more esthetic final prosthesis.

Keywords: Peri-implant tissues, Esthetics, Prostheses and implants.

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INTRODUCTION

Prosthetic rehabilitation using osseointegrated implants is a commonly utilized procedure in cases of patients missing one or more teeth. The high success rates and shortened rehabilitation times that are observed with implant-supported prostheses have made their use routine in the practice of oral rehabilitation.¹⁻³ However, to optimally implement these techniques, many elements are necessary, including accurate patient histories, careful clinical and imaging examinations, articulator-mounted models, and diagnostic wax-ups. Given these elements, it is often possible to visualize the outcome of prosthetic rehabilitation before surgery, which can then be used to guide the precise placement of the implants.

Production of esthetically pleasing results is considered to be the greatest challenge with respect to implant-supported prosthetic rehabilitation. The condition of the soft tissues surrounding the implants as well as the careful manipulation of these tissues during surgery is extremely important in these procedures. Ideally, the proper placement of implants should be determined by taking into account as many of the biological, prosthetic, and esthetic principles pertinent to the restoration as possible. Therefore, clinical examinations should be performed to identify local anatomical features that might interfere with an optimal esthetic result, as these features could require some form of clinical or surgical intervention to condition the soft tissues prior to implant installation.⁴ Most importantly, the position of the implant with respect to the bone will determine the contours of the surrounding soft tissue, including the area of the interproximal papilla, which will in turn determine the esthetic appearance of the final prosthesis.⁵

When planning the installation of implants in esthetically important areas, it is necessary to determine the precise location of the dentogingival contour, a process that is usually performed during the provisional restoration stage. The location of the dentogingival contour will determine whether surgical alteration of the surrounding soft tissue or bone will be necessary, and it will also determine the apical-coronal position of the implant platform, which should be placed 3 mm below the contour.⁶ This distance is necessary to install the prosthetic abutment and to generate biological space as well as to allow the ideal emergence profile of the prosthetic crown. Provisional restorations also guide the buccolingual position of the implant, which should be at least 1 mm lingual to the restoration margin and in proper relation to the buccal emergence profile of the adjacent teeth. When ideal implant positioning is not possible, additional surgical procedures may be necessary.

Another important variable to consider during the planning stages of prosthetic surgery is the distance between tooth and implant (or the distance between separate implants). A minimum distance of 1.5 mm between tooth and implant (or 3 mm between separate implants) has been suggested to maintain the bone crest and, in turn, the interdental papilla. It is important to note that a horizontal loss of interproximal bone should be expected when these distances are not observed, which will lead to an increase in the distance between the contact point and the bone crest, compromising the preservation of the interdental papilla.^{7,8}

The amount of keratinized gingiva in the implantation area is also considered to be important, especially when implants are designed to replace upper anterior teeth. A lack of keratinized gingiva may lead to changes in the peri-implant area and compromise the manipulation of soft tissues during surgery; these problems can make it difficult to achieve a proper emergence profile, in addition to increasing the risk of gingival recession and marginal bone resorption.⁹ Therefore, it is recommended that a band of keratinized gingiva be left to provide gingival-margin stability and allow tissue conditioning following the installation of prosthetic crowns.¹⁰

The loss of anterior teeth is often accompanied by a lack of keratinized gingiva or changes to the surrounding soft tissues, leading to additional surgical procedures to attenuate these problems. In an alternative scenario, adequate soft tissue coverage and/or keratinized gingiva might exist, but these tissues could need to be manipulated to fit into the regular gingival-concave contour. In the latter case, provisional restorations with the appropriate contours should be performed simultaneously with gingival conditioning of the edentulous area. The surgical guide for implant installation should be generated from these provisional restorations.

Here, we present a clinical case in which the maxillary central incisors had been lost. Provisional restorations together with gingival conditioning were performed to serve as a guide during implant installation.

CLINICAL CASE REPORT

Poor esthetics and discomfort were the major complaints of a female patient missing her maxillary central incisors (11 and 21); the patient used removable partial dentures and had metal-ceramic crowns on her upper lateral incisors (12 and 22) (Fig. 1). A clinical radiographic examination detected a residual ridge of adequate height, bone thickness, and soft tissue volume as well as a sufficient band of keratinized gingiva. However, a defined regular concave



Fig. 1: A photograph depicting the original appearance of the area surrounding teeth 11 and 21; these teeth have been replaced with a removable partial denture clasp and metal-ceramic crowns on teeth 12 and 22

or interdental papillae could be observed (Fig. 2). The proposed plan was to install implants in the edentulous areas of the central incisors and to install metal-ceramic crowns to the lateral incisors as well as to the implants.

Provisional restorations were implemented using a diagnostic wax-up and installed using the lateral incisors as abutments (Fig. 3). Gingival conditioning of the edentulous area was performed to define the dentogingival contour of the prosthetic crowns and to aid in the creation of interdental papillae, which were then used as guides to install the implant. A countersinking technique was used for gingival conditioning, which was performed with diamond-tipped drills to remove a layer of gingival tissue and expose the underlying connective tissue, with the outline of the exposed area being defined by the provisional restoration (Fig. 4). Following the countersinking procedure, the provisional restoration was rebased (Fig. 5), and the pontic area was polished to prevent biofilm accumulation and to provide proper hygienic conditions. The provisional



Fig. 2: The edentulous areas showing an adequate volume of soft tissue and a band of keratinized gingiva which are favorable for gingival conditioning



Fig. 3: The provisional restoration created using a diagnostic wax-up and installed using the lateral incisors as abutments



Fig. 6: The provisional restoration 15 days after performing the gingival conditioning. Note the health of the tissues



Fig. 4: The edentulous areas were sculpted using the countersinking technique for gingival conditioning



Fig. 7: The emergence profile and the dentogingival integration



Fig. 5: Rebasing of the provisional restoration



Fig. 8: The conditioned tissues demonstrating a regular concave arc and interdenal papillae, as defined by the provisional restoration

restoration also provided protection and served as a cicatricial guide to orient the contour of the regular concave arc and the formation of papillae. After 15 days, the tissue was conditioned, showing a promising gingival architecture with a healthy gingiva, an emergence profile of the temporary crowns, and a regular concave arc with interdenal papillae formation (Figs 6 to 8).

A mold was made using condensation silicone to reproduce the shape and contour of the provisional restorations, which was then employed to produce the surgical guide for the implants installation (Fig. 9). A minimally invasive incision was performed that preserved the papillae and the shape of the conditioned area (Fig. 10). The surgical guide was used to direct the installation of the



Fig. 9: Testing of the surgical guide which has the same characteristics as the provisional restoration



Fig. 11: The surgical guide in position with position indicators



Fig. 10: A minimally invasive incision preserving the interdental papillae

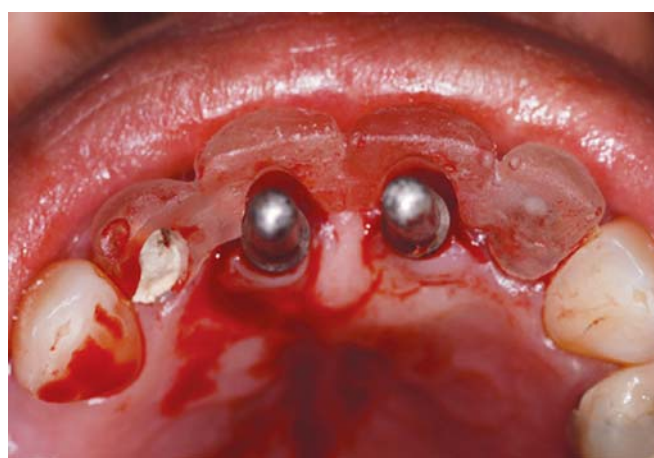


Fig. 12: An occlusal view of the surgical guide with the position indicators

implants (Sin SIHSN 4511, São Paulo, Brazil) (Figs 11 and 12). Immediate provisionalization of the implants was performed to maintain the gingival contour and the interdental papillae (Figs 13 and 14). At 4 months after installation, the provisionary restorations were removed, and the area that had received the gingival conditioning was reassessed (Fig. 15). Finally, the procedures for clinical molding and transfer of the gingival contour were initiated to fabricate metal-ceramic crowns (Figs 16 to 18).

DISCUSSION

To achieve optimal outcomes with implant-supported prostheses, it is essential to understand and take into account the anatomical and clinical variables that affect the esthetics of prosthetic rehabilitation. In addition to osseointegration, an harmonious interaction between implants and the surrounding soft tissues is required, which is especially true when maxillae are partially edentulous in esthetically important areas.¹¹ Prior to performing the clinical procedures necessary to fabricate the final prostheses, these tissues need to be properly healed.



Fig. 13: Immediate provisionalization

A 3 to 4 mm wide band of soft tissue forms a biological barrier that is critical for the stability of tissues around implants.¹² A significant soft tissue recession of approximately 0.6 mm in the first 6 months and 1.6 mm in the first 24 months following the installation of a prosthetic crown is expected for implants from one-stage surgical procedures.¹³ With respect to implants from two-stage surgical procedures, a gingival recession can be expected



Fig. 14: The provisional restorations 30 days after implant installation



Fig. 17: A radiographic profile of the implants and metal infrastructures



Fig. 15: The appearance of the gingival contour and the interdental papillae 4 months after implant installation



Fig. 18: The metal-ceramic restorations with dentogingival integration and maintenance of the interdental papillae



Fig. 16: A trial of the metal infrastructure with transfer of the emergence profile

in the first 3 months following the installation of the implant,¹⁴ although some studies have found the soft tissues to be relatively stable and to exhibit low levels of gingival recession after this type of clinical approach.¹⁵⁻¹⁷

The presence or absence of interdental papillae is considered to be a significant parameter with respect to the esthetics of conventional and implant-supported rehabilitation. Normally, following tooth loss, resorption

of the bone crest occurs, with consequent changes in the dentogingival contour. Therefore, understanding the condition of the papillae is important to determine the implant location and prostheses fabrication. A papilla will be present between two teeth whenever there is a distance of less than or equal to 5 mm between the bone crest and the contact point between the teeth; if this distance is 6 mm, the papilla will completely fill the space in 60% of cases; if the distance is 7 mm, the space will be filled in only 25% of cases.⁷ When an implant is located adjacent to a tooth, the behavior of papillae is similar because a distance of less than 5 mm from the contact point will ensure that the space is completely filled. Between implants, the maintenance or development of papillae is more difficult, and an evaluation of the lateral distance between implants is necessary; a papilla of 3 to 4 mm can be expected to form, when a minimum amount of proximal bone loss has occurred following dental extraction and the implants are placed 3 mm apart to preserve the bone crest.^{17,18}

In addition to healthy peri-implant tissues, soft-tissue conditioning is often required before or after installing implants to create an emergence profile and suitable

dentogingival contours.¹⁹ Gingival conditioning prior to implant installation increases the predictability of the esthetic results of the restoration. An immediate provisionalization can also be performed, providing the patient with the comfort of an esthetically stable restoration during the healing phase; this also eliminates the need for a second surgery, which increases the acceptability of treatment. Provisionalization also helps to maintain the gingival contour and interdental papillae, providing stability for the peri-implant tissues.²⁰⁻²²

CONCLUSION

The esthetics of implant-supported prostheses depends on the careful manipulation of peri-implant tissues. Procedures that facilitate the proper placement and installation of implants to achieve more esthetically pleasing rehabilitation outcomes should be implemented during the planning phases of these procedures. In the case presented here, provisional restorations and soft tissue conditioning prior to implant installation were found to be effective for placing the implants in the proper three-dimensional position and for determining the dentogingival contour and emergence profile of the prosthesis.

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