Accurate transposition of peri-implant soft tissue morphology in anterior prosthesis: case report

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Introduction: *The emergence profile for implant-supported prostheses is the portion of the restoration that emerges coronally from the implant to the free gingival margin, giving support and stability to peri-implant soft tissues and mimicking the natural tooth. Restorations with appropriate contour have a significant effect on oral hygiene, health and esthetics of peri-implant tissues. The greatest challenge involved in manufacturing permanent prosthesis is the duplication of the emergence profile obtained with the provisional restoration secured to the cast. Several techniques have been published, but no consensus has been reached on the literature regarding which method is the most accurate.* Objective: *The objective of this study is to present a technique for molding the emergency profile and peri-implant tissues by presenting a clinical case.* Keywords: *Dental impression material. Dental implants. Dental prosthesis.*

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

INTRODUCTION

Despite advances in techniques, products and published protocols well-established for grafting and bone defect reconstruction, some cases can only be solved by prosthetic procedures.[1,2] In this context, providing an adequate emergence profile for implant-supported prostheses, especially in esthetic zones, is a challenge posed on day-to-day clinical practice.

The emergence profile for implant-supported prostheses is the portion of the restoration that emerges coronally from the implant to the free gingival margin. It replaces the crown of the extracted tooth,[3] mimicking the natural tooth[4,5] and the gingival structure of adjacent teeth while preserving soft tissues in the long term. Restorations with appropriate contour have a significant effect on oral hygiene, health and esthetics of peri-implant tissues.[6,7]

With a view to obtaining the ideal emergence profile for the permanent prosthesis, implant treatment must be conducted, as from the beginning, with techniques and material that allow so, with adequate implants ideally placed in tridimensional position, so as to provide favorable gingival contour,[1,8,9] followed by the correct choice of healer[9,10] and use of provisional restoration.[11] Provisional restorations are the best devices used to shape peri-implant soft tissues,[12] since they avoid abrupt changes of contour, thereby decreasing the probability of recession after crown placement.[13,14] Gallucci et al[15] demonstrated that abrupt changes of soft tissues, not only in dimension, but also in health, might happen after the anatomical contour has been established.

The greatest challenge involved in manufacturing permanent implant prostheses is the duplication of the emergence profile obtained with the provisional restoration, which consists in transposing information to the dental cast, thereby providing the laboratory technician with data necessary to reproduce the volume of the provisional restoration in the final prosthesis. Several techniques have been published, but no consensus has been reached on the literature regarding which method is the most accurate. Nevertheless, the objective of this study is to present a technique of molding the emergency profile and peri-implant tissues by presenting a clinical case.

CASE REPORT

A 27-year-old patient, in good general health, sought dental treatment with a major complaint of shape, color and size of anterior teeth, particularly tooth #11 which was darkened. CT scans revealed horizontal root fracture in the cervical and middle thirds of tooth #11, which caused its extraction to be considered in treatment planning (Figs 1A, B and C; Fig 2).

Due to favorable conditions, the extraction procedure was concurrently planned with immediate Straumann Bone Level™ Regular Cross Fit

Figure 1. Closed-up view of patient's smile. Focus on darkened tooth #11.

Figure 2. Tomographic view evincing horizontal root fracture in the cervical and middle thirds of tooth #11.

4.1 x 12-mm implant (Straumann, Villeret, Switzerland) placement associated with connective tissue and Bio Oss™ (Geistlich, Wolhusen, Switzerland) grafting. Once excellent primary stability had been certified, the immediate provisional restoration was manufactured for subsequent finishing with a lithium disilicate EmaxPress™ dental crown (Ivoclar Vivadent, Liechtenstein, Germany) associated with a ZirCad™ zirconia custom abutment (Ivoclar Vivadent, Liechtenstein, Germany).

After osseointegration, tissue conditioning sessions were carried out by means of minor alterations performed in the emergence profile of the provisional restoration until satisfactory esthetic results were achieved (Figs 3A and B).

In general, dental casts of implant-supported crowns are made with standard prefabricated impression copings; however, the latter are ineffective in copying an individualized emergence profile, since peri-implant soft tissues are made stable by the volume of the provisional restoration. Additionally, as soon as the device is removed, contouring undergoes alterations, which hinders accurate transposition of soft tissues morphology. With a view to addressing this problem, a technique for individualization of prefabricated copings was developed, in which the contour of the provisional restoration emergence profile is copied.

Initially, in order to have a custom impression coping, the provisional restoration is secured to a prefabricated implant analogue which corresponds to the implant placed in the mouth. The area corresponding to the emergence profile is then molded with thick addition silicone (Virtual™, Ivoclar Vivadent, Liechtenstein, Germany). Once the material has set, the provisional restoration is unscrewed from the analogue and the prefabricated impression coping is secured to it. It has been advocated that the gap between the impression

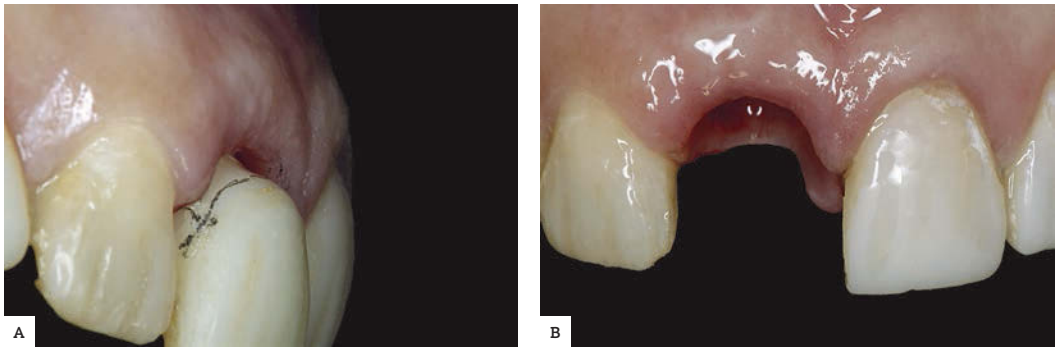


Figure 3. Tissue conditioning with a provisional restoration.

coping and the addition silicone be filled with rigid material, such as flowable composite or acrylic resin. Thus, when placing the impression coping into the patient's mouth, it will reproduce the shape of the provisional restoration while keeping soft tissue contour. This technique allows a dental cast with artificial gingiva to be manufactured, and provides the technician with information about the shape of the emergence profile (Fig 4).

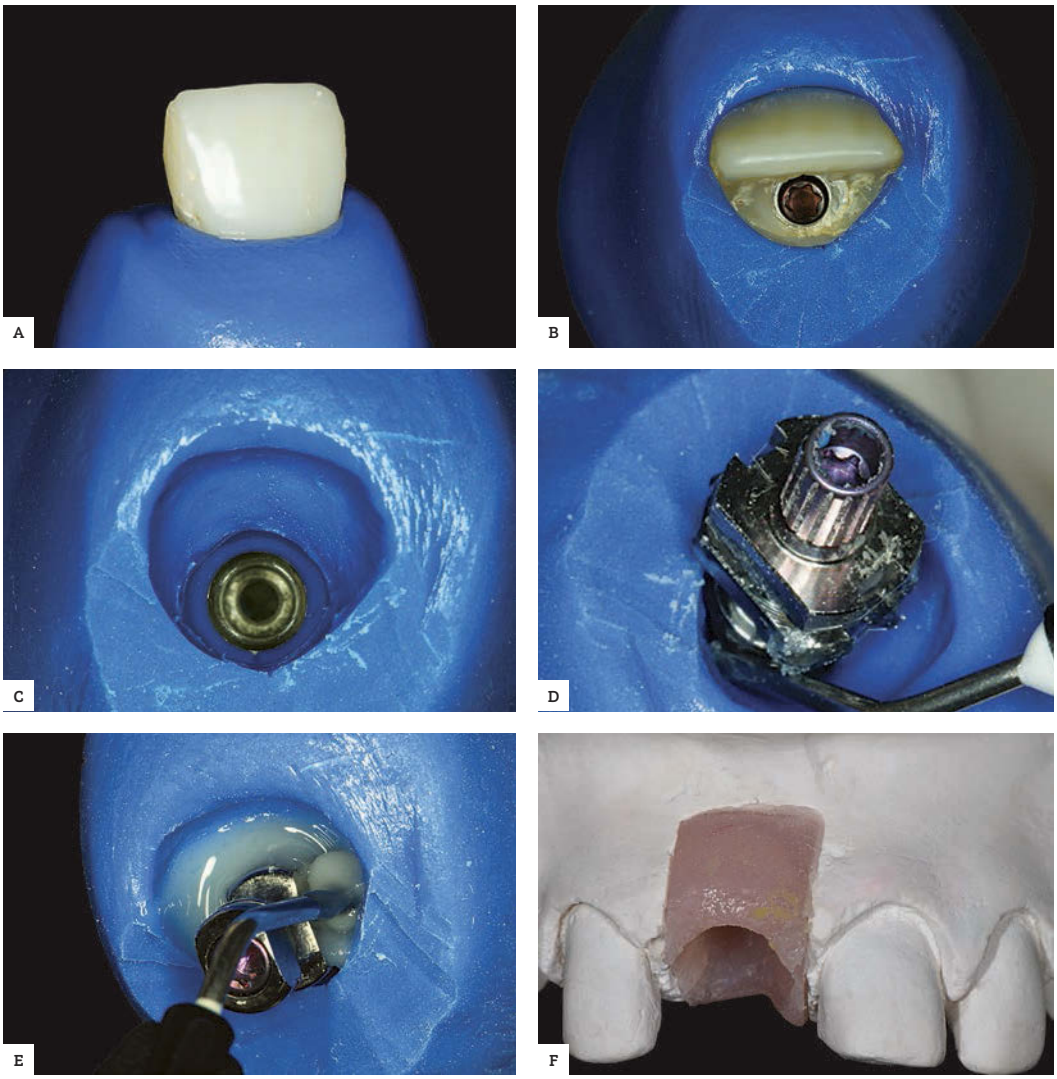
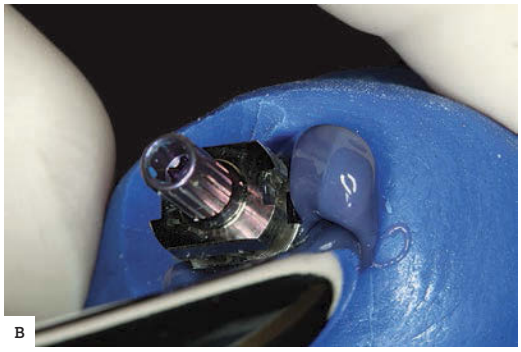


Figure 4. Custom impression coping being manufactured. **A** and **B**) Provisional restoration impression coping secured to an implant analogue by thick addition silicone. **C**) Gap corresponding to the emergence profile. **D** and **E**) Gap filled with flowable composite resin. **F**) Dental cast with artificial gingiva.

A



B

C

Figure 5. A) Application of polyether adhesive on the impression coping. **B**) Filling with polyether. **C**) Dental cast without artificial gingiva.

Nevertheless, the technique described herein also requires a second cast in which the emergence profile gap is filled with elastomeric material, such as polyether (Impregum™, 3M, Sumaré, São Paulo, Brazil). This is because the latter presents with favorable features of reproducibility, dimensional stability, stiffness, resistance to tearing[16,17] and lack of chemical bond to addition silicone. Consequently, the elasticity provided by both addition silicone and polyether results in a completely rigid cast, without the need for artificial gingiva near the implant (Figs 5A, B and C).

Figure 6 evinces the accuracy of custom copings made of flowable composite resin and polyether, as a result of previous molding with a provisional restoration.

The cast with artificial gingiva allows the laboratory technician to manufacture a permanent prosthesis of which contour resembles, as much as possible, the ideal emergence profile contour, thereby allowing it to be placed and removed several times during the manufacturing process without damaging the cast. However, due to artificial gingiva resilience, this type of cast does not allow the technician to evaluate over contouring near the emergence profile of the permanent crown, which would negatively affect soft tissue contour previously obtained with the provisional restoration. Hence, having a second rigid cast available allows the technician to perform fine adjustments to the emergence profile. Figures 7, 8 and 9 depict the sequence of final procedures.

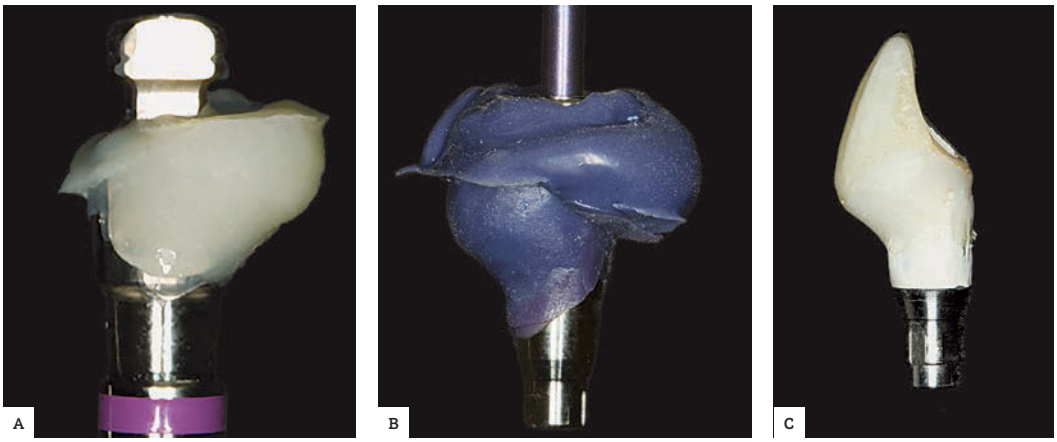


Figure 6. Custom impression copings with flowable composite resin (**A**) and polyether (**B**) obtained from the provisional restoration (**C**).

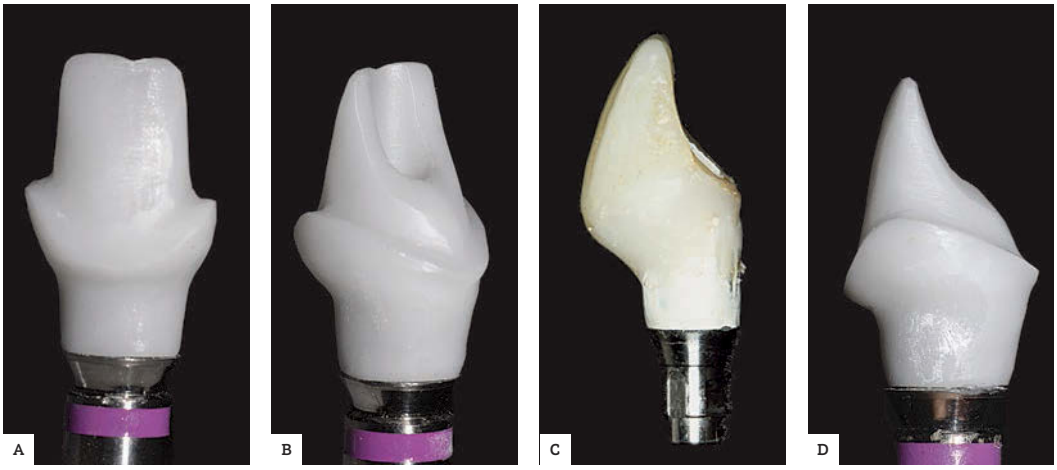


Figure 7. A, **B**) Frontal and occlusal view of the custom abutment. **C** and **D**) Emergence profile obtained from the abutment compared to the provisional restoration.

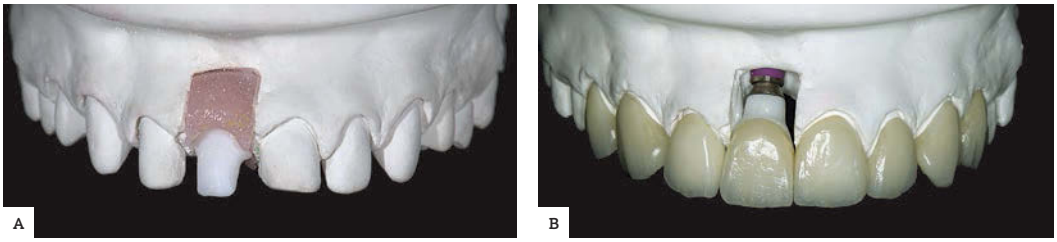


Figure 8. Crown manufacture.

Figure 9. Finished case.

DISCUSSION

With a view to providing patients with esthetics, function and health with the aid of implant-supported prostheses, the clinician must be focused on assessing the residual ridge, peri-implant soft tissues and the shape of the crown. The presence of significant asymmetry is among the aforementioned factors and will cause changes in the shape of the restoration, causing food retention and plaque accumulation around implants, and, as a result, damaging the health of surrounding tissues and decreasing implant survival.[11]

A provisional restoration is the most important means of diagnosis of esthetic, speech and functional issues, in addition to being a tool that allows prosthetists, patients and laboratory technicians to communicate, making all of them aware of the final outcomes of treatment.[4,18,19] Additionally, it is used during soft tissue healing,[4,20,21] and allows recontouring and manufacture of the emergence profile without further trauma and in a gradual manner.

Several types of material are used for impression taking. Polyether and vinyl

polysiloxane (or addition silicone) impression material are the most recommended to be used for transposition of the emergence profile to the implant-supported prosthesis due to their favorable features of accurate reproducibility, dimensional stability, stiffness and resistance to tearing.[16,17]

The greatest challenge involved in obtaining the ideal emergence profile for a permanent prosthesis is the reproducibility of the peri-implant contour achieved with the provisional restoration. Most impression copings are of cylindrical shape and do not resemble the shape of natural teeth.[10] Thus, using them for final impression procedures will result in casts that do not reproduce the features of soft tissues; as a result, the laboratory technician will have difficulty manufacturing the emergence profile,[6] which might hinder permanent restoration success.[22]

A number of techniques for transposition of the emergence profile from a provisional restoration to a permanent one have been reported, as it is the case of the method in which two identical provisional restorations are manufactured and one of them is used for impression taking.[5] This technique, however, might involve changes in the position of the provisional restoration during vibration caused at the time of manufacturing the dental cast, especially in the anterior region where prostheses are smaller and, most of times, are not immune to potential rotation. Furthermore, some authors advocate the use of a provisional restoration in the mouth as coping;[23] however, the patient has to wear it during cast manufacture, which is enough to cause damage to soft tissues and provide the patient with discomfort when the device is reinserted. Elian et al[6] proposed that two dental casts be manufactured, a conventional one made of plaster and which requires copings of cylindrical shape, and another one in which coping is made with the aid of provisional restorations and soft material; which better replicates peri-implant tissue contour. This technique not only requires a higher number of clinical steps, but also involves higher costs, since soft material is more expensive and is used in larger amounts. Another method reported in the literature advocates the relief of the cast in the cervical region of the tooth to be manufactured and the injection of soft impression material around the provisional restoration placed in the cast.[24] Moreover, other authors have custom impression copings of cylindrical shape made with flowable composite resin[25] or light-curing acrylic resin[20] directly poured on the tissue surrounding the implant previously shaped by the provisional restoration. Nevertheless, as mentioned above, once the provisional restoration is removed from the mouth, the tissue is damaged, thereby hindering the accuracy of the cast. For those who advocate the use of acrylic resin, direct contact of the material with soft tissues might cause thermal and chemical irritation to susceptible patients.[26]

In the case reported herein, the impression coping technique used was the most frequently cited in the literature.

A custom impression coping is made by molding the provisional restoration emergence profile and filling the gap with rigid material, flowable composite resin, which results in casts with artificial gingiva. Nevertheless, it is suggested that this technique be associated with a second cast in which the custom impression coping is made with elastomeric material. The advantage of this procedure is the manufacture of a completely rigid cast, without the need for artificial gingiva, and the rationale behind it is the fact that a rigid cast allows potential over contouring near the permanent prosthesis emergence profile to be corrected. This cannot be checked for accuracy in the first cast due to artificial gingiva resilience. Over countering might cause changes in tissue stability which, in turn, affects gingival contour and esthetics previously determined in the provisional restoration. A rigid cast can also be used for prosthesis manufacture by means of the CAD/CAM technology in which the emergence profile is scanned more accurately and directly on the cast.

CONCLUSION

This impression technique proved effective in duplicating peri-implant tissue contour for the dental cast, thereby aiding the laboratory technician to replicate the provisional restoration emergence profile for the final prosthesis in a more accurate manner. Hence, soft tissue stability is expected to be maintained in the long term.

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