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A Clinically Oriented Digital Workflow for Replicating the Emergence Profile in Implant Restorations

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Abstract

Introduction: The peri-implant soft tissue contour plays a critical role in the long-term success of implant-supported restorations. Customized healing abutments or provisional prostheses are commonly used to shape this contour. After tissue maturation, it is essential to accurately transfer the emergence profile to the definitive prosthesis. Conventional techniques, such as the Modified Direct Transfer Coping Technique, aim to replicate the subgingival shape by customizing impression copings to match the provisional. However, these methods can be time-consuming and technique-sensitive. Recent advances in CAD/CAM have enabled digital alternatives, though some remain impractical due to the need for non-dental software and complex workflows.

Objective: This article introduces a streamlined, fully digital protocol using dental-specific software to record and transfer peri-implant soft tissue contours and emergence profiles from provisional to definitive prostheses.

Case Report: A healthy patient presented with traumatic loss of both maxillary central incisors. Following implant placement and provisionalization, three intraoral digital scans were obtained using the Medit i700 scanner. The scans were superimposed to accurately replicate the matured emergence profile in the final zirconia crowns.

Discussion: This technique provides a simplified and reproducible workflow for digitally capturing soft tissue contours without relying on reverse-engineering platforms. It enhances precision, efficiency, and patient comfort in implant prosthodontics.

Conclusion: The proposed digital approach offers a predictable and clinically applicable alternative to traditional methods for transferring the emergence profile. Further clinical studies are required to validate its long-term outcomes.

Keywords: Digital impressions; Emergence profile; Implant prosthodontics; Intraoral scanning; Provisional prostheses; Modified Direct Transfer Coping Technique.

Introduction

Establishing a natural and functional emergence profile is a critical step in implant prosthodontics. This can be achieved either through custom healing abutments placed at implant surgery or provisional prostheses following osseointegration. Preserving the peri-implant soft tissue architecture is essential for both aesthetic and biological success, as the soft tissue contour directly impacts the final appearance and the health of the peri-implant seal.

Traditional impression techniques to replicate these profiles often involve complex and time-consuming manual modifications or require the use of non-dental reverse-engineering software, making them technique-sensitive and less practical for everyday clinical use. (1)

With advances in digital dentistry, intraoral scanners and CAD/CAM technology have created new possibilities for accurately capturing and transferring these soft tissue contours. However, many existing digital workflows remain complicated due to reliance on external software and multiple steps. (2)

This article introduces a simplified, fully digital protocol using dental-specific CAD software to precisely replicate the emergence profile and gingival contour shaped by provisional prostheses. This approach enhances accuracy, efficiency, and patient comfort in the fabrication of definitive implant-supported prostheses.

Case Report:

A.M., a 32-year-old patient in good general health, presented following the traumatic loss of his two maxillary central incisors caused by a road traffic accident. After careful evaluation, the treatment plan was to restore the missing teeth with two implant-supported full zirconia crowns. This case report focuses on a digital protocol designed to accurately transfer the emergence profile created by the provisional restorations to the definitive prostheses, ensuring optimal aesthetic and biological outcomes.

The protocol Involved acquiring three digital Impressions using the Medit I700 intraoral scanner, followed by precise data processing and restoration fabrication. The workflow is detailed as follows:

1. Initial Digital Impression (Figure1):

Once the peri-implant mucosa had stabilized around the provisional prostheses, an intraoral scan was performed capturing the topography of the provisional crowns, the adjacent teeth, and the surrounding soft tissues. This scan reflects the clinical

situation with the provisional restorations in place, including the gingival contours shaped by the soft tissue response.

Figure 1 (a,b): First Scan (STL1): Captured the provisional restoration still attached to the implants, along with at least two adjacent teeth.

2.Implant Position Recording (Figure 2):

Next, the provisional crowns were removed, and scanbodies were attached to the implants to accurately capture their three-dimensional position. A digital impression of the implants, adjacent teeth, and soft tissues was taken. Although the subgingival tissue collapses upon provisional removal, this step is crucial to record implant orientation for precise restoration design.

Figure 2 (a,b) : Second Scan (STL2): Obtained after removing the provisional restoration and attaching a scan body to the implant. This scan served as the reference scan and required a complete arch digital impression.

3.Extraoral Scan of Interim Restoration (Figure 3):

The provisional prostheses were then scanned extraorally to capture their full anatomy, especially the subgingival surfaces that shape the soft tissue emergence profile. This scan provides detailed data on the contours that must be replicated in the final restoration

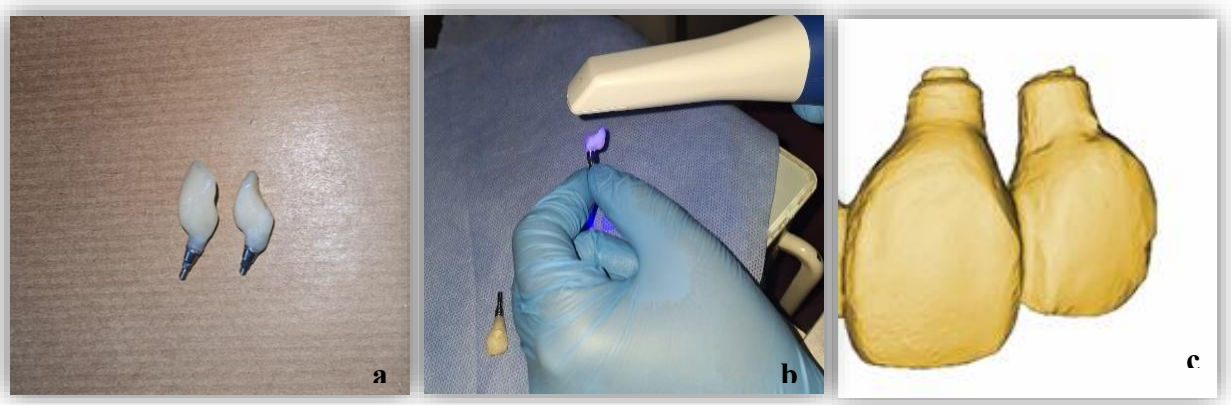

Figure 3 (a,b,c) : Third Scan (STL3): Performed extraorally, capturing the provisional restoration while fixed on an implant analog.

To complete the digital dataset, occlusal relationships were recorded with the provisional restorations repositioned in the mouth using a bite scan. All digital files were then imported into dental CAD software, where a best-fit superimposition aligned the implant positions with the soft tissue and provisional anatomy. This merging combined precise implant location data with the matured gingival contours to create a comprehensive model for restoration design.

Based on this merged dataset, the definitive zirconia abutments and crowns were digitally designed, faithfully replicating the emergence profile established by the provisional restorations to preserve soft tissue architecture and optimize aesthetics. A stereolithographic model incorporating an implant analog was printed to serve as a working model, allowing the dental technician to finalize the veneering of the zirconia crowns while maintaining the natural contours of the emergence profile.

Finally, the definitive prostheses were placed intraorally (Figure 4), demonstrating excellent adaptation, aesthetics, and preservation of the peri-implant soft tissue contour, thus validating the efficacy of the digital workflow.

Figure 4: Final result after Data Processing and Prosthetic

Discussion

This clinical report presents a digital impression technique that enables the simultaneous capture of peri-implant soft tissue contours, the emergence profile, and the three-dimensional spatial position of the implant. Unlike conventional impression methods, this approach preserves the integrity of the gingival architecture during the scanning process, thereby minimizing the risk of soft tissue collapse. (2)

Accurately recording the morphology of peri-implant soft tissues is clinically challenging, particularly in the absence of interim restorations, which play a crucial role in maintaining gingival form. However, the emergence profile of provisional restorations typically mirrors the internal contour of the soft tissue, allowing for reliable and undistorted subgingival imaging using digital scanners. (3)

Digital impressions provide a detailed and accurate representation of soft tissue morphology in its clinical state. In the present case, a carved palatal gingival notch was incorporated to evaluate the marginal fit of a customized zirconia abutment and framework on a resin model with enhanced precision.

Compared to traditional techniques, this digital workflow offers several clinical advantages, including reduced chairside time, decreased material consumption, and improved patient comfort. Furthermore, the integration of advanced dental software allowed for direct superimposition of the digital impression onto the design files of the zirconia abutment and framework, facilitating a more streamlined collaboration between clinician and dental technician. (4) (5) (6)

While the described technique demonstrates promising clinical utility, further research and robust clinical trials are warranted to establish its efficacy and reproducibility across a broader range of clinical scenarios. (7) (8)

This technique ensures that the emergence profile and peri-implant soft tissue contours developed through provisionalization are precisely replicated in the definitive restoration. By scanning the provisional restoration extraorally and registering it digitally with intraoral scans, tissue collapse is avoided, and accuracy is preserved. (9) (10)

Conclusion

The described workflow provides a practical and efficient way to replicate peri-implant emergence profiles using digital technology. It bridges the gap between provisional and definitive restorations by maintaining soft tissue architecture through a fully digital, reproducible protocol. Compared to conventional techniques, this method reduces clinical time, improves patient comfort, and simplifies laboratory procedures. The integration of dental-specific CAD software makes the process more accessible for practitioners, although further clinical validation is needed.

References

1. Alshhrani WM, Al Amri MD. Customized CAD-CAM healing abutment for delayed loaded implants. J Prosthet Dent 2016;116:176-9.
2. Wittneben JG, Buser D, Belser UC, Bragger U. Peri-implant soft tissue conditioning with provisional restorations in the esthetic zone: the dy namic compression technique. Int J Periodontics Restorative Dent 2013;33: 447-55.
3. Chatzistavrianou D, Shahdad S. An alternative design to overcome the problem of unfavorable implant angulations for a screw-retained, implant supported fixed prosthesis: two clinical reports. J Prosthodont 2015;24: 589-93.
4. Tselios N, Parel SM, Jones JD. Immediate placement and immediate provi sional abutment modeling in anterior single-tooth implant restorations using a CAD/CAM application: a clinical report. J Prosthet Dent 2006;95:181-5.
5. Priest G. Virtual-designed and computer-milled implant abutments. J Oral Maxillofac Surg 2005;63:22-32.
6. Proussaefs P. A novel technique for immediate loading single root form implants with an interim CAD/CAM milled screw-retained crown. J Oral Implantol 2016;42:327-32.
7. Schoenbaum TR, Han TJ. Direct custom implant impression copings for the preservation of the pontic receptor site architecture. J Prosthet Dent 2012;107: 203-6.
8. Shor A, Schuler R, Goto Y. Indirect implant-supported fixed provisional restoration in the esthetic zone: fabrication technique and treatment work f low. J Esthet Restor Dent 2008;20:82-97.
9. Tsai BY. A method for obtaining peri-implant soft-tissue contours by using screw-retained provisional restorations as impression copings: a clinical report. J Oral Implantol 2011;37:605-9.
10. Ntounis A, Petropoulou A. A technique for managing and accurate regis tration of periimplant soft tissues. J Prosthet Dent 2010;104: