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DENTAL TECHNIQUE

A digital technique for replicating peri-implant soft tissue contours and the emergence profile

Xiaoqiang Liu, DDS, PhD,[a] Jianzhang Liu, DDS, PhD,[b] Hong Mao, BD,[c] and Jianguo Tan, DDS, PhD[d]

ABSTRACT

A digital technique is presented that records peri-implant soft tissue contours and the emergence profile. The architecture of interim restorations and adjacent teeth, the position of the implant, and the emergence profile of interim prostheses are scanned and registered to design a zirconia frame and to form a digital cast. (J Prosthet Dent 2017;118:264-267)

A customized healing abutment at the time of implant placement[1] or an interim restoration after osseointegration[2,3] are recommended to create ideal soft tissue contours. After the maturation and stabilization of the peri-implant mucosa, the soft tissue contours must be accurately preserved and transferred to the definitive restoration.[4] Previous studies have proposed different techniques for transferring emergence profiles. Generally, the impression post is intraorally[5-7] or extraorally[8-11] modified to mimic the transmucosal part of the interim prosthesis, or the interim restoration is used with a direct[12,13] or indirect[14,15] impression coping. Recently, computer-aided design and computer-aided manufacturing (CAD-CAM) have also been used to transfer the emergence profile from the interim to the definitive restoration.[16-19] Moreover, a fully digital technique which directly records impressions of peri-implant soft tissue contours from interim restorations has been reported[20]; however, the scanned files were registered using a specific reverse engineering software but not a dental software. The workflow was not straightforward or convenient enough for dentists or dental technicians.

The present technique proposes a new digital impression workflow that captures soft tissue contours and the emergence profile around implant-supported interim restorations as well as the 3-dimensional (3D) position of the implant.

TECHNIQUE

1. After an ideal emergence profile is created and the peri-implant soft tissue has matured (Fig. 1), capture the surface architecture of the interim restoration and adjacent teeth as well as the vestibular and palatal gingiva, using an intraoral scanner (TRIOS

Figure 1. Peri-implant soft tissue conditioned with interim restoration.

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[a]Lecturer, Department of Prosthodontics, Peking University, School and Hospital of Stomatology, Beijing, PR China.
[b]Associate Professor, Department of Prosthodontics, Peking University, School and Hospital of Stomatology, Beijing, PR China.
[c]Technician, Segma Healthcare Company Ltd, Beijing, PR China.
[d]Professor, Department of Prosthodontics, Peking University, School and Hospital of Stomatology, Beijing, PR China.

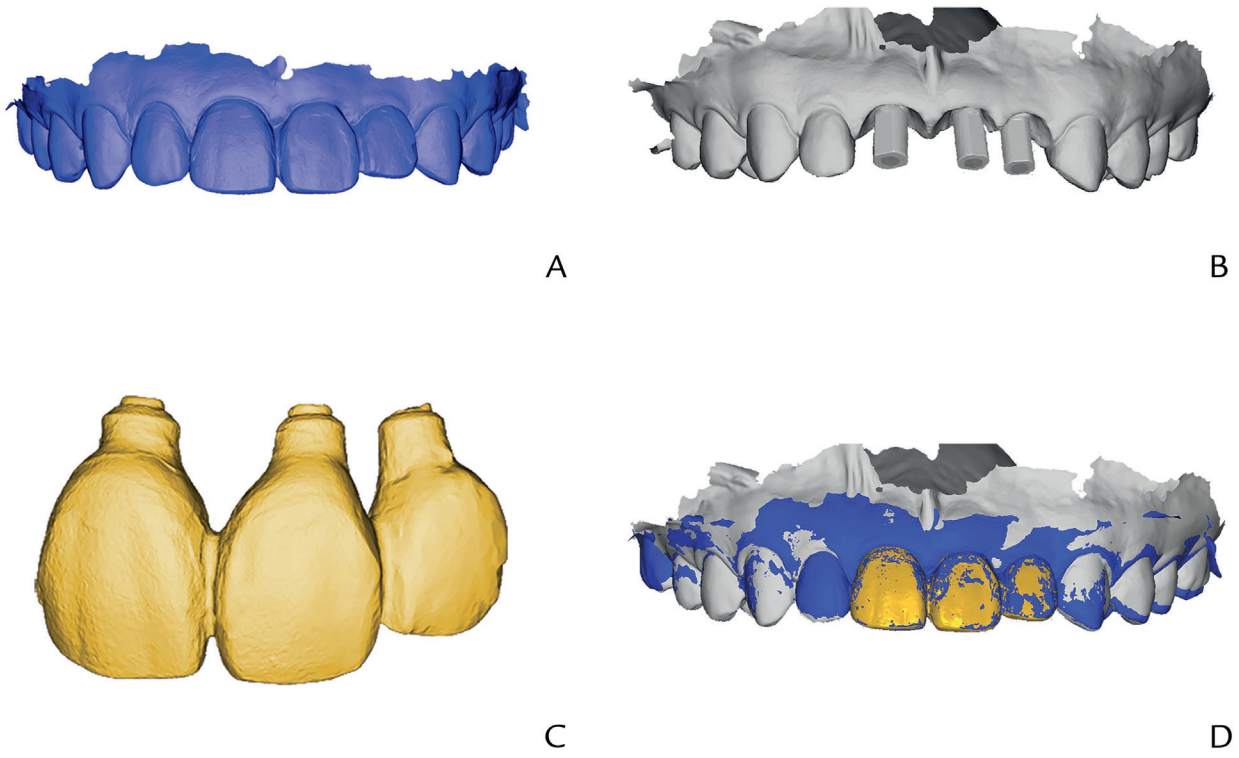

Figure 2. A, Surface architecture with interim restoration in place. B, Implant position. C, Emergence profile of interim prostheses D, B, and C superimposed to generate impression with implant position, peri-implant mucosa, and emergence profile.

A/S; 3Shape A/S) while the interim restorations are in place. Save the first digital impression as a .3ox file named File A (Fig. 2A).

2. Gently remove the interim restorations from the patient's mouth. Use standardized implant scan-bodies (Segma SB-BG; Segma) to record the implant position along with simultaneous scans of the adjacent teeth and mucosa but without accurate subgingival soft tissue contours because of its collapse. Save the second digital impression as File B (Fig. 2B).
3. Scan the interim restorations, including the supragingival and subgingival regions, extraorally with an intraoral scanner (TRIOS; 3Shape A/S), the emergence profile of which would represent the subgingival soft tissue contours. Save the third digital impression as File C (Fig. 2C).
4. Replace the interim restorations. Continue to scan the antagonist arch and the occlusal registration, which completes the digital impression process.
5. Import files A to C into a digital dental software (Segma Dental CAD; Segma). Superimpose the 3D implant positions from File B and the emergence profile of interim restorations from File C onto File A through registration of the clinical crowns. Use the "best fit" algorithm for superimposing the files in order to obtain a digital model, which is saved as File D (Fig. 2D).

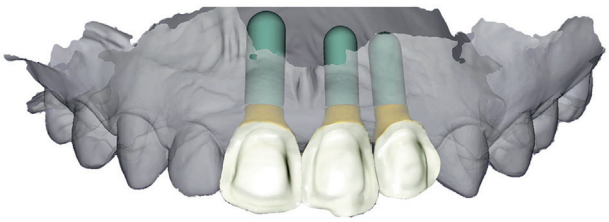

Figure 3. Customized zirconia abutment and zirconia framework. Subgingival contours copied from interim prosthesis.

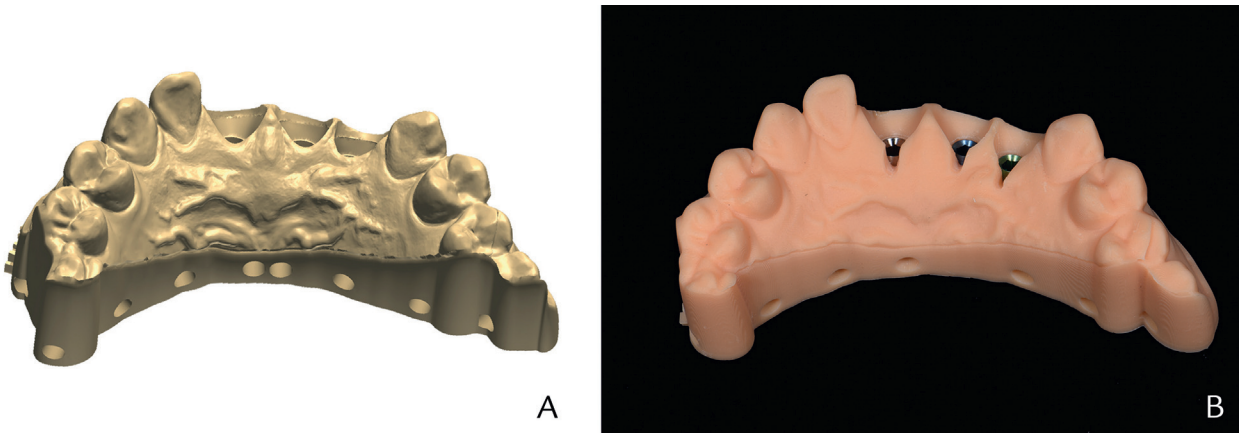

Figure 4. Casts with implant position and peri-implant soft tissue contours. A, Digital. B, Resin.

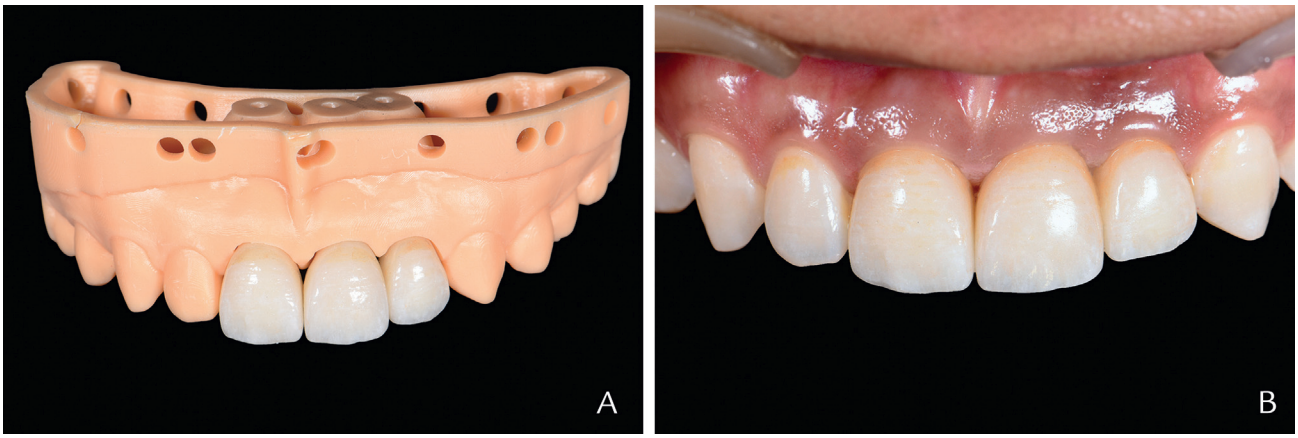

Figure 5. Definitive restorations. A, Resin cast. B, Intraorally.

6. Design the customized CAD-CAM zirconia abutment and the definitive restoration framework on the digital model and save it as File E. Consequently, the subgingival contours of the definitive restoration are copied from the interim prostheses (Fig. 3).
7. Use a Boolean operation to subtract File E from File D to obtain the digital definitive cast (Fig. 4A).
8. Print a stereolithographic cast using a 3D printer (Perfactory Desktop Digital Dental Printer; EnvisionTEC) with an implant analog inserted (Fig. 4B). Carve a notch on the palatal gingival margin of each restoration. The dental technician finishes veneering the ceramic on the resin model with peri-implant soft tissue contours and the emergence profile (Fig. 5A).
9. Place the definitive restorations intraorally to complete the restoration procedure (Fig. 5B).

DISCUSSION

This digital impression technique records peri-implant soft tissue contours and the emergence profile as well as the 3D implant position within a single digital impression, avoiding the collapse of the gingival architecture while recording the impression. Recording optimal soft tissue contours is a challenging procedure. Peri-implant soft tissues are supported by interim restorations, without which the gingival architecture will collapse. Fortunately, because inner soft tissue contours and the emergence profile of interim restorations tend to complement each other, the scanned images of subgingival prostheses are usually not distorted. Digital impressions represent the clinical appearance of soft tissues. The carved notch on the palatal gingiva allows the marginal fit of the customized zirconia abutment and frame to be evaluated on the resin model.

In contrast to traditional impression techniques, the present clinical procedure could save time and materials and improve patient comfort. The dental software used in this example allowed direct superimposition of the digital impression onto the design of the zirconia abutment and frame. The workflow is straightforward and convenient for both dentist and dental technician. However, additional scientific evidence is necessary before promoting the widespread use of this technique.

SUMMARY

The present article describes a digital technique that allows the replication of peri-implant soft tissue contours and the emergence profile in a feasible and straightforward manner.

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Corresponding author:
Dr Jianzhang Liu
Department of Prosthodontics
Peking University, School and Hospital of Stomatology
22 Zhongguancun Ave South
Haidian, Beijing, 100081
PR CHINA
Email: liujianzhangdr@163.com