THE JOURNAL OF PROSTHETIC DENTISTRY

DENTAL TECHNIQUE

A reverse digital workflow by using an interim restoration scan and patient-specific motion with an intraoral scanner

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ABSTRACT

Interim crowns provide important information as they have been evaluated on patients and can guide the choice of optimal tooth shape, occlusal vertical dimension, and anterior guidance. A protocol with a reverse digital workflow and dynamic occlusion recorded by using an intraoral scanner is presented. (J Prosthet Dent 2020;■:■-■)

Most prosthetic procedures on natural abutments and implants require interim restorations, maintaining comfort and esthetics and evaluating the function and form of the restorations.[1,2] In analog workflows, most of the useful data are captured with impressions and cross-mounted casts.[3,4] The wax patterns for the definitive restorations can be guided by a silicone index of the interim restorations and a maxillomandibular recording made at the same vertical dimension of occlusion.[5,6] In digital dentistry, each phase of treatment is recorded by intraoral scanning, and the dental laboratory technician can access the preoperative and interim restoration scans during the laboratory design workflow.[7]

The present technique takes advantage of the preoperative scan and the patient-specific motion recording that provides the patient's dynamic occlusion in eccentric movement through an intraoral scanner (TRIOS 3 or TRIOS 4; 3Shape A/S). Access to the files requires a subscription to a laboratory computer-aided design and computer-aided manufacturing software program (Dental System; 3Shape A/S).

TECHNIQUE

This technique is suitable for both tooth-supported and implant-supported fixed restorations. The interim restorations are used to record the maxillomandibular relationships, and the occlusal vertical dimension is established and tested clinically with patient feedback and the patient's dynamic occlusion TRIOS patient-specific motion. By scanning the interim restorations, a file is obtained (prepreparation), which allows the rapid recording of the conditioned tissues where pontics or implants are present.

1. In the initial prescription, click the prepreparation option on the screen that indicates the interim restoration scan (Fig. 1).
2. Scan the antagonist arch (Fig. 2).
3. Scan the arch with the interim restorations (Fig. 3). If both arches require restorations, both should be scanned with interim restorations in place.
4. Do not follow the original predetermined software workflow but instead go to the last step (Fig. 4), hence the term reverse workflow. Scan the maxillomandibular relationship and the specific patient motion with interim restorations in place (Fig. 4).
5. Return to the regular flow after scanning both arches, and trim the area of the interim restorations involving approximately 1.5 mm of gingival

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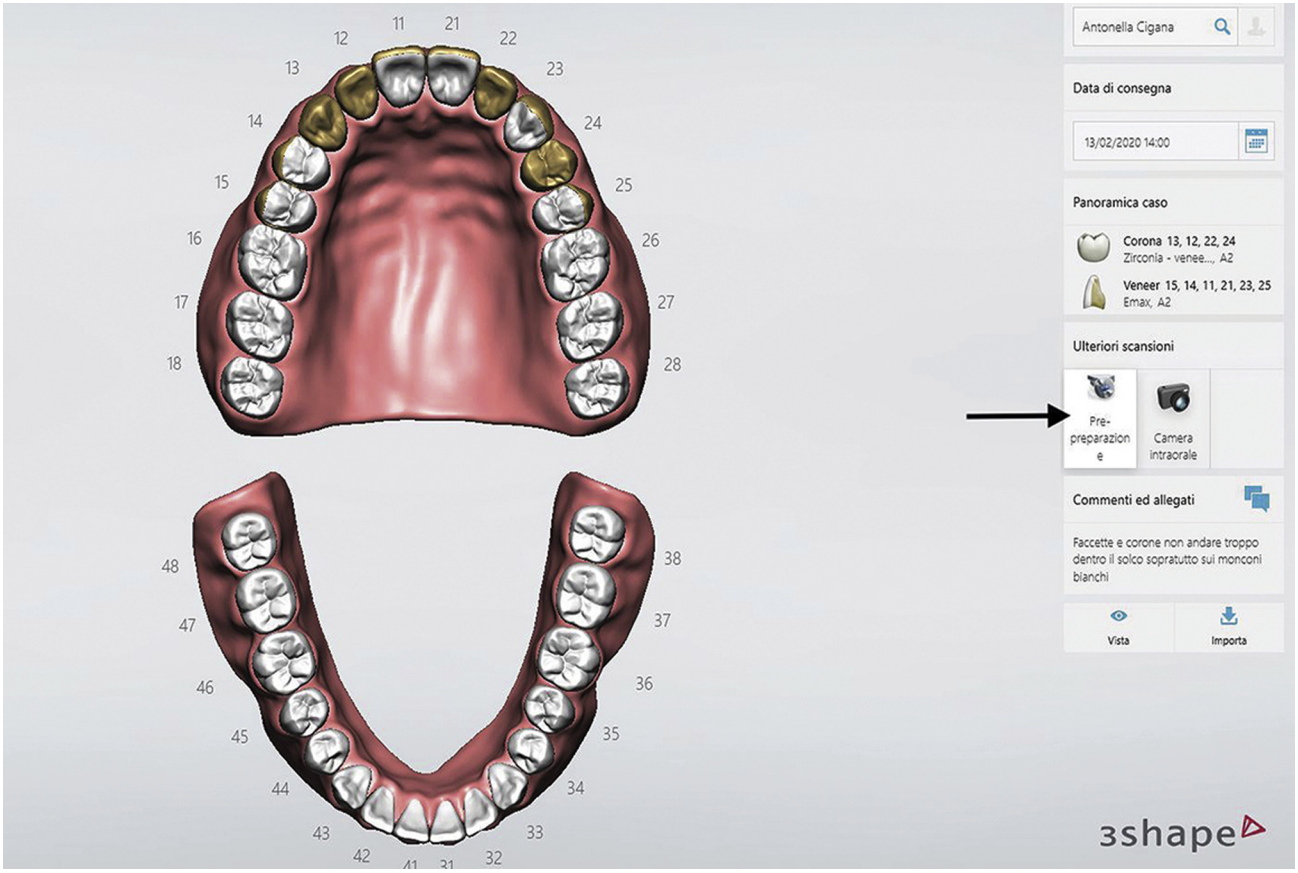

Figure 1. Prescription window. Prepreparation option clicked.

Figure 2. Antagonist arch scan.

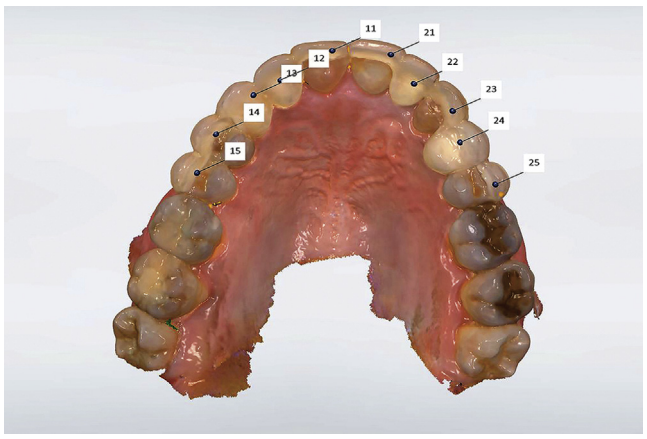

Figure 3. Interim restorations scan.

tissue (Fig. 5). Use the same procedure regardless of whether the restorations are on teeth or implants.

6. If displacement cords were placed for the impressions, remove one cord at a time, scanning the abutment individually. If the interim restoration technique[8] for gingival displacement was used, keep the cords in place until a few seconds before scanning. For implants, unscrew the interim restoration and scan the peri-implant soft tissue individually (Fig. 6).
7. After the peri-implant soft tissue has been scanned, place a scan body on the implant to record the correct position of the implant (Fig. 7).
8. Following the TRIOS workflow, a maxillomandibular relationship scan should have been

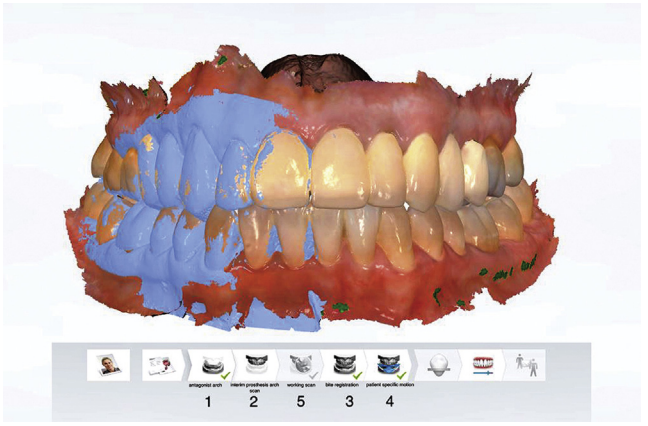

Figure 4. Maxillomandibular relationship record and patient-specific motion with interim restorations: reverse workflow with numbers that indicate chronological order of scans.

Figure 5. Prepreparation scan trimmed. As many reference points preserved as possible in soft tissues so that scanner can better triangulate with master scan.

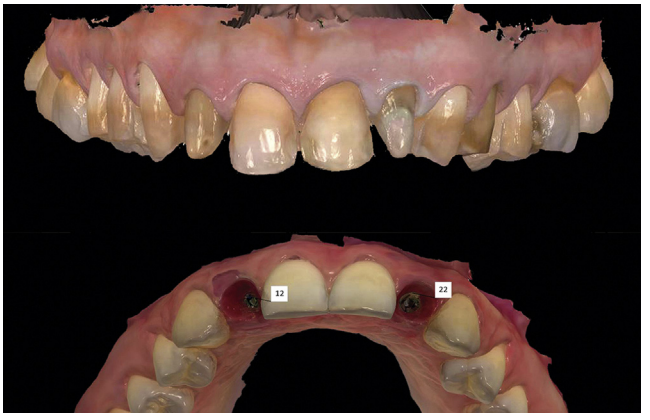

Figure 6. Natural abutment scan or peri-implant soft-tissue scan if implants present.

Figure 7. Scan bodies in situ to record implant position.

made. At this point, the software will show the abutments in the static and dynamic relationship that was previously recorded with the interim restorations in place (step 4), without having to record it on the tooth or implant abutment (Fig. 8).

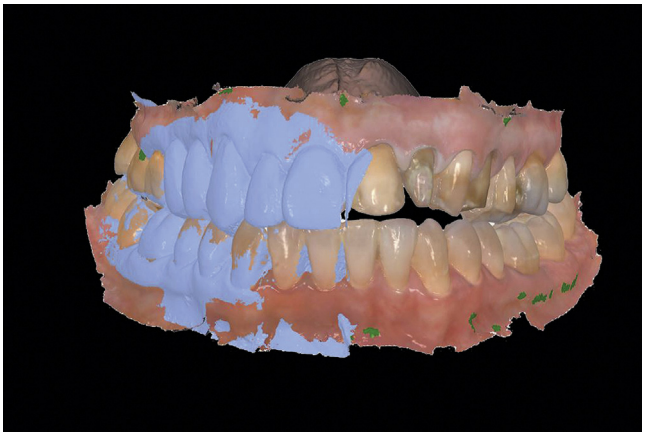

Figure 8. Scan capturing abutments occluding in same position previously recorded with interim restorations in place.

DISCUSSION

Advantages of the reverse workflow and specific patient motion technique include that information is captured by scanning the interim restorations in the static and dynamic occlusions that have been tested and approved by the patient for esthetics and occlusal vertical dimension. Interim restorations on implants are removed at the last second[9,10] to minimize collapse of the peri-implant soft tissues and without the need for custom impression copings or alternative procedures.[11-14] Most laboratory design software programs are able to superimpose all relevant information (up to 7 scans for some software programs) during the digital design, and the technician can recall the scans needed on the screen.

Figure 9. A, Before and after treatment, tooth-supported restorations. B, Before and after treatment, implant-supported restorations.

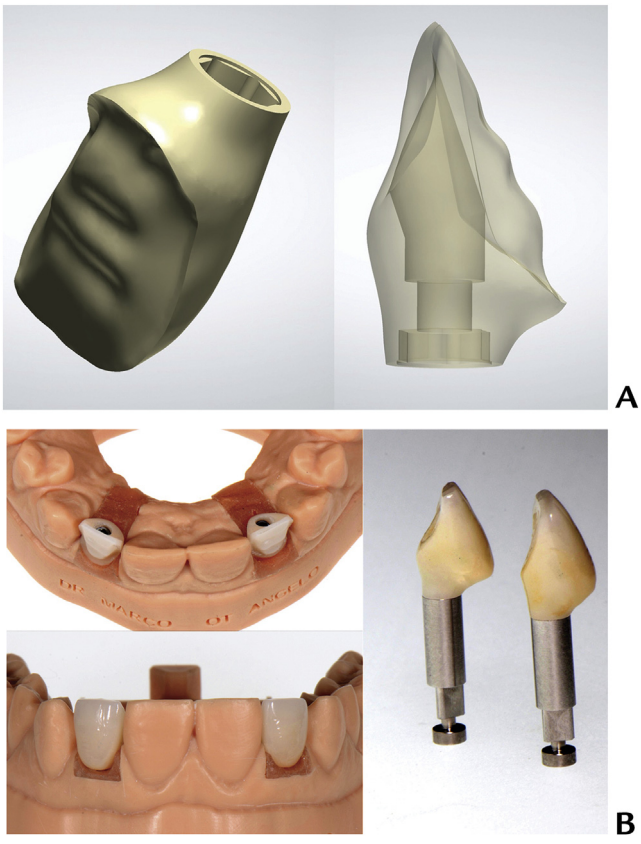

Figure 10. A, Computer-aided design of implant-supported crowns. B, Definitive restoration with veneering porcelain.

The reverse workflow technique and the use of monolithic restorations,[15,16] avoiding any porcelain veneering on the occlusal intaglio of the crown, allow the reproduction of the interim restorations on the definitive restorations,[17,18] as well as the static and dynamic occlusion with the Dental System design software (3Shape A/S). This is a new paradigm in prosthetic dentistry; for the first time, the patient mandibular movements are not simulated by using an articulator but individually recorded. This approach can be used in esthetic areas if the structure is designed to receive a porcelain veneer (Fig. 9). This digital workflow is a reliable and efficient treatment option (Fig. 10), as it improves restoration quality by reducing errors.[19-21]

SUMMARY

A technique is described that allows clinicians and dental technicians to obtain valuable information by scanning the interim restorations and soft-tissue displacement so that they can use it to design definitive restorations more rapidly.

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https://doi.org/10.1016/j.prosdent.2020.05.011