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JPD DIGITAL - VIDEO ARTICLE

Rapid Digital Conversion 2.0: A cast-less workflow for complete arch implant-supported restorations

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SUMMARY

The transition from conventional to digital workflows in prosthodontics has reshaped complete arch implant rehabilitation. Traditional protocols require multiple analog steps, including cast fabrication, mounting, and verification, which may compromise efficiency.[1] Previous hybrid intraoral–extraoral scanning approaches have provided improvements but still required physical verification steps and cast fabrication.[2] Available fully digital protocols often rely on reference screws and multiple scans before and after surgery,[3,4] or denture impressions to mount the information.[5,6] These additional steps may increase complexity and introduce errors through repeated data merges.[7,8]

Rapid Digital Conversion (RDC) 2.0 represents a cast-less digital alternative in which the patient serves as the articulator and occlusion is established virtually[9,10]—without the need for reference screws or multiple scan merges.[11,12] This article and accompanying video demonstrate the step-by-step application of this technique for a complete arch implant-supported prosthesis.

ABSTRACT

Accurate data acquisition is essential for the efficiency and predictability of complete arch implant–supported restorations. Conventional and hybrid workflows often require multiple analog steps, such as cast fabrication, mounting, verification, or the use of reference screws with repeated scans. These additional procedures may increase complexity, prolong treatment, and introduce errors through multiple dataset merges. Rapid Digital Conversion (RDC) 2.0 represents a fully digital, cast-less workflow that eliminates the need for reference screws, physical casts, and intraoral verification jigs. In this protocol, the patient serves as the articulator and occlusion is established virtually. This video article demonstrates the clinical application of RDC 2.0 in a mandibular complete arch prosthesis. An anterior scanning device was fabricated from a sectioned immediate denture and connected to anterior multiunit abutments to capture the interocclusal record. The scan was completed with soft-tissue scan bodies, followed by a biocopy step and definitive alignment. The resulting dataset provided all information necessary for digital articulation, implant position integration, and interim restoration design. RDC 2.0 simplifies the restorative process, reduces chair time, minimizes potential errors, and enables accurate same-day or next-day delivery of interim restorations. (J Prosthet Dent 2026;135:847-853)

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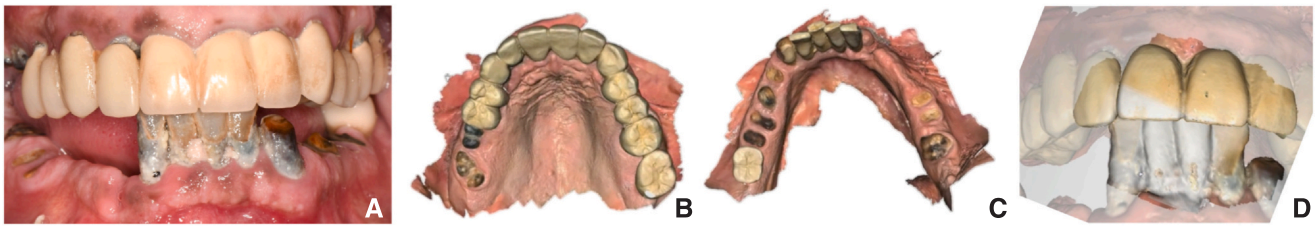

Figure 1. Clinical view and digital recordings. A, Initial clinical photograph before treatment. B, Intraoral scan of maxillary arch. C, Intraoral scan of mandibular arch. D, Intraoral scan of occlusal registration.

This clinical treatment demonstrates the application of the digital conversion workflow in a 51-year-old patient with terminal maxillary and mandibular dentition. The treatment plan consisted of a maxillary immediate interim denture and the placement of 6 mandibular implants, followed by delivery of a complete arch implant–supported interim prosthesis fabricated and delivered within 16 hours post-surgery.[13,14]

A comprehensive digital scanning protocol was initiated, capturing the maxilla, mandible, and interocclusal record (Fig. 1). During intraoral scanning with the scanner (Primescan; Dentsply Sirona) in combination with the Face Scan Mate device, the patient's nose was also recorded to aid cross-referencing (Fig. 2). A complete facial scan was subsequently acquired with the facial scanner (Vectra; Canfield Scientific), and the nasal reference from both datasets was aligned to create a stable registration point between facial and intraoral scans (Fig. 3).

Using a facially driven design approach, a 3-dimensionally (3D) printed immediate denture was planned in a software program (exocad; exocad GmbH) (Fig. 4). Both maxillary and mandibular prostheses were printed with a 3D printer (Formlabs 4B; Formlabs Inc) using Premium Teeth Resin. A computer-aided design and computer-aided manufacture (CAD-CAM) surgical guide was also fabricated to support accurate implant placement.

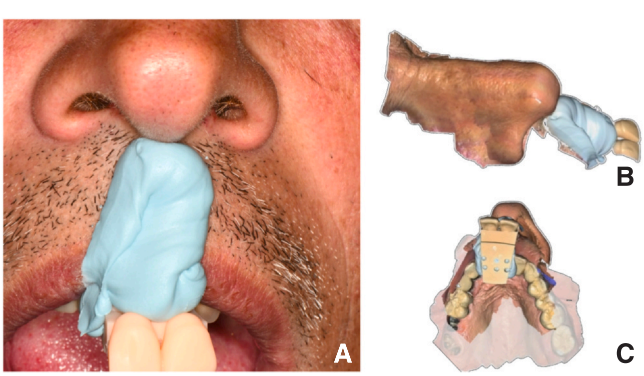

Figure 2. Using the Face Scan Mate device. A, Clinical photograph showing Face Scan Mate device seated on central incisors with impression material connecting it to nose. B, Intraoral scan capturing nose with device. C, Superimposed dataset showing alignment of nose scan with device, and maxillary scan.

Six mandibular implants were placed according to the surgical guide. Multiunit abutments (MUAs) (Ritter Implants) were connected, and the surgical sites were sutured (Fig. 5). At this point, a mandibular anterior scanning device (ASD) was fabricated from the immediate denture. The denture was secured to the 2 anterior MUAs with interim cylinders and pattern resin, then removed and sectioned distal to the canines, and repositioned to the anterior MUAs, thereby forming the ASD (Fig. 6).

To complete the scanning setup, soft-tissue scan bodies (True Abutment) were connected to the posterior MUAs distal to the ASD. Concurrently, the maxillary teeth were extracted and an immediate denture was delivered.

The mandibular arch was scanned with the ASD and posterior soft-tissue scan bodies in place. A complete scan of the maxillary immediate denture was then performed. Occlusal registration was achieved by scanning the maxillary denture in occlusion against the mandibular ASD (Fig. 7).

Next, a digital "biocopy" (duplicate mandibular scan) was generated and automatically it was mounted in occlusion. This biocopy was digitally trimmed to remove the ASD data while preserving the posterior scans and maintaining the lingual soft-tissue continuity between the right and left segments. Clinically, the ASD was then removed and replaced with anterior soft-tissue scan bodies. The anterior region was rescanned, and this dataset was merged with the trimmed biocopy to produce a complete mandibular edentulous scan with all soft tissue scan bodies represented and accurately articulated to the maxillary arch (Figs. 8 and 9).

The implant positions were recorded using soft issue scan bodies (IO Connect; True Abutment) (Fig. 10). The scans were uploaded to the True Abutment platform, which generated an accurate implant-position dataset (Fig. 11). Because this dataset preserved the geometry of the soft-tissue scan bodies, it could be directly superimposed on the intraoral scan (Fig. 12). The final merged dataset included all required clinical information: Implant positions. Soft-tissue morphology. Occlusal registration. Digital articulation. This was accomplished without the need for reference screws, verification jigs, or stone casts.

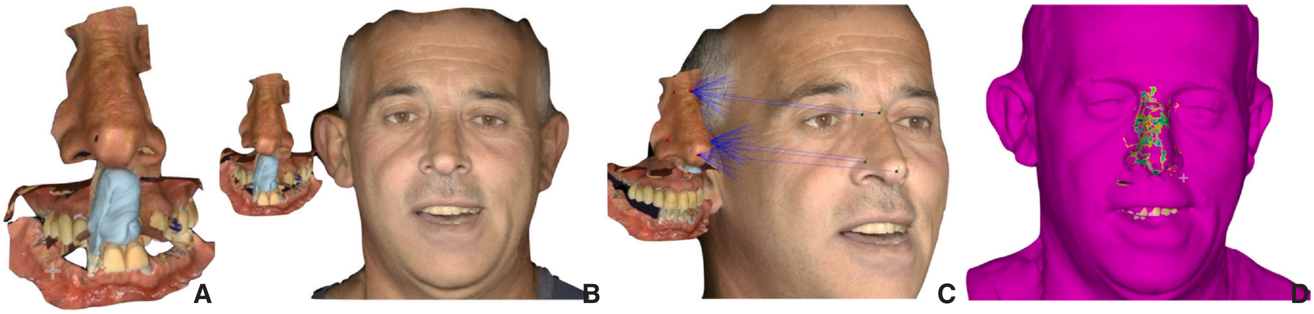

Figure 3. Combining scans for occlusion. A, Combined scan of nose, maxilla, and mandible in occlusion. B, Dataset with facial scan for reference. C, Matching process aligning nose from facial and intraoral scans. D, Final alignment of facial scan onto intraoral scan.

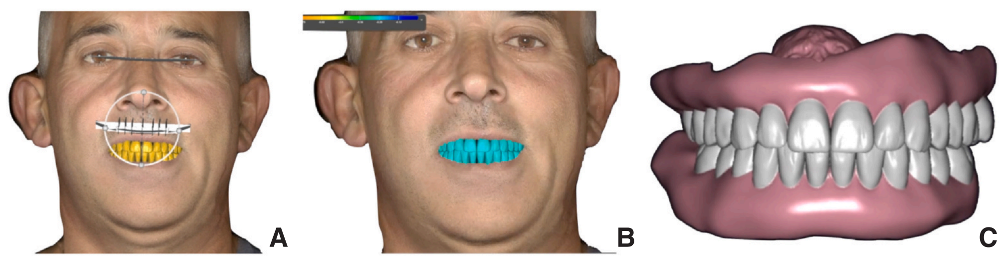

Figure 4. Facially driven prosthetic design. A, Facial scan after trimming teeth portion for prosthetic design. B, Continued facially driven design process using trimmed scan. C, Maxillary and mandibular immediate dentures digitally designed and prepared for 3-dimensional printing.

Figure 5. Post-surgical view before prosthetics. Intraoral view of mandibular arch following extractions, implant placement, and seating of multi-unit abutments. Sutures visible, and site ready to start data acquisition phase.

The interim restoration was digitally designed using a software program (exocad; exocad GmbH) (Fig. 13) and milled (Roland DWX-53DC; DGSHAPE Corp.). The restoration was delivered 16 hours after surgery, completing the conversion process (Fig. 14).

DISCUSSION

The RDC 2.0 workflow is fully digital and eliminates the need for physical casts, mounting procedures, or

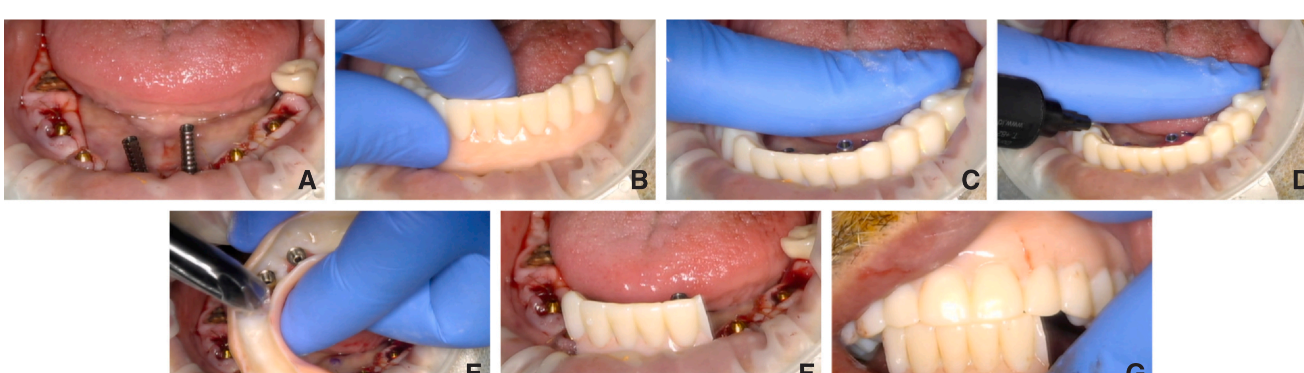

Figure 6. Creating anterior scanning device. A, 2 interim cylinders on anterior implants. B, C, Immediate denture seated on these cylinders. D, Pattern resin connecting denture to cylinders. E, Denture removed and reinforced with more resin. F, Anterior scanning device sectioned and reattached to 2 anterior implants. G, image of maxilla and mandible in occlusion.

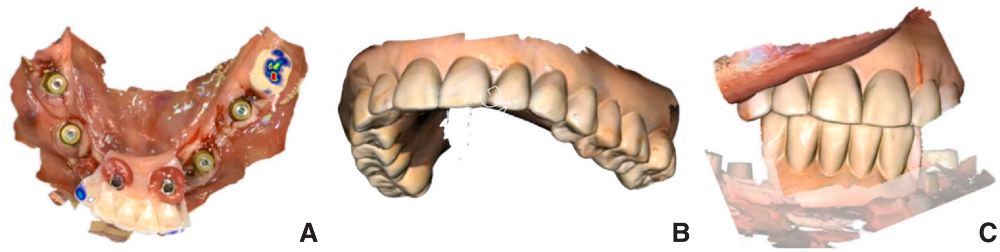

Figure 7. Intraoral scanning process. A, Mandibular scan with anterior scanning device and posterior scan bodies. B, Maxillary scan. C, Occlusal scan of maxilla and mandible.

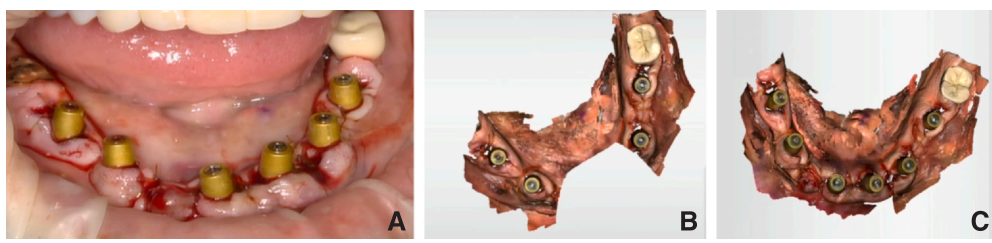

Figure 8. Additional mandibular scan. A, Clinical view of mandibular arch after removal of anterior scanning device and placement of anterior soft-tissue scan bodies. B, Supplementary mandibular scan, trimmed to exclude anterior scanning device segment. C, Finalized mandibular dataset showing all soft-tissue scan bodies in place with previously missing areas digitally completed.

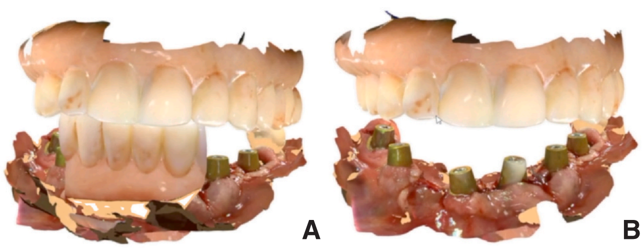

Figure 9. Definitive occlusion scans. A, Maxillary and mandibular scans in occlusion with anterior scanning device. B, Definitive occlusion scans with soft-tissue scan bodies and optimal vertical dimension.

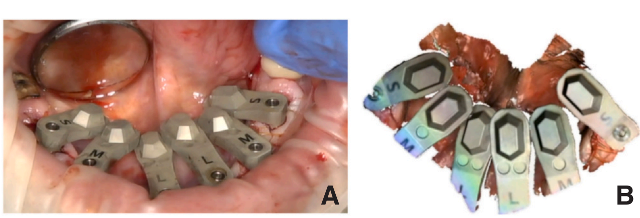

Figure 10. IO Connect scan bodies. A, Clinical image of IO Connect scan bodies on multi-unit abutments. B, Scan capturing all IO Connect scan bodies.

intraoral conversion immediately after implant placement.[15,16] By digitally articulating intraorally captured data, the restorative workflow becomes simplified and reproducible.[17,18] This approach reduces chair time, accelerates laboratory fabrication, and maintains accuracy in implant position, soft-tissue morphology, and occlusal registration.[19] Errors are minimized by reducing the number of merges—only a single alignment

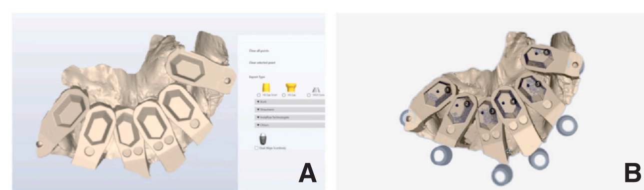

Figure 11. Uploading and generating implant positions. A, Scan of IO Connect scan bodies uploaded to IO Connect platform. B, Generated implant position dataset from scan bodies.

between implant position and soft-tissue scan bodies is required.[20]

Compared with other fully digital protocols, RDC 2.0 reduces surgical interruptions and complexity. Protocols that rely on reference screws require anesthetizing areas that otherwise would not need to be treated, placing at least three reference screws, and interrupting surgery to perform pre-extraction scanning.[21] After extractions and implant placement, the screws must remain intact to allow a postsurgical scan, which is then matched to the limited reference screw data from the presurgical scan that also contains the bite. Similarly, denture impression–based workflows rely on relining the denture over bleeding sites and attempting to match the intaglio surface scan of the relined denture to the intraoral soft-tissue scan, which is challenging and often compromises occlusion and the prosthetic setup due to increased error potential.

Nevertheless, with the RDC 2.0 workflow, several important clinical considerations remain. Following

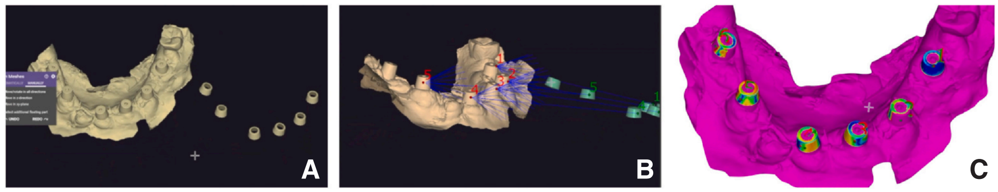

Figure 12. Alignment of mandibular and implant position scans. A, Mandibular scan with soft-tissue scan bodies shown alongside implant position dataset provided by True Abutment. B, Alignment process demonstrating superimposition of implant position dataset onto soft-tissue scan body dataset. C, Superimposed dataset showing mandibular scan accurately merged with True Abutment implant position dataset.

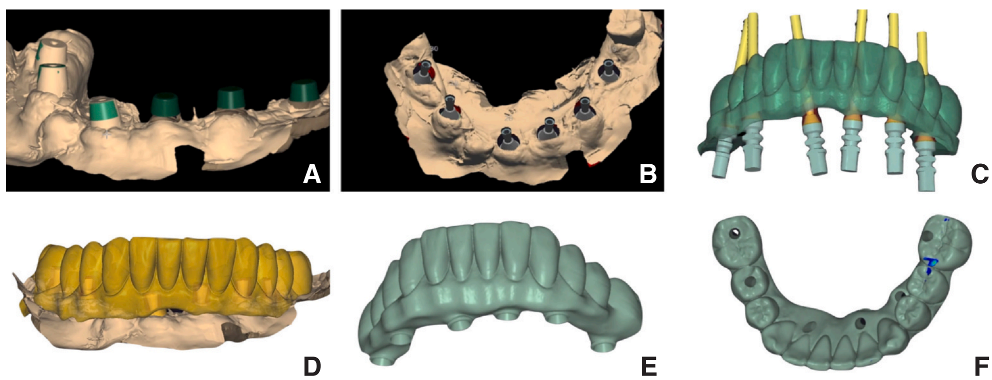

Figure 13. Designing restoration. A, Using exocad to match IO Connect data and determine implant positions. B, Placement of virtual implant analogs through soft-tissue scans. C, Initial stages of prosthetic design. D, Continued refinement of design. E, F, Finalized design of complete arch restoration shown from both facial and occlusal views.

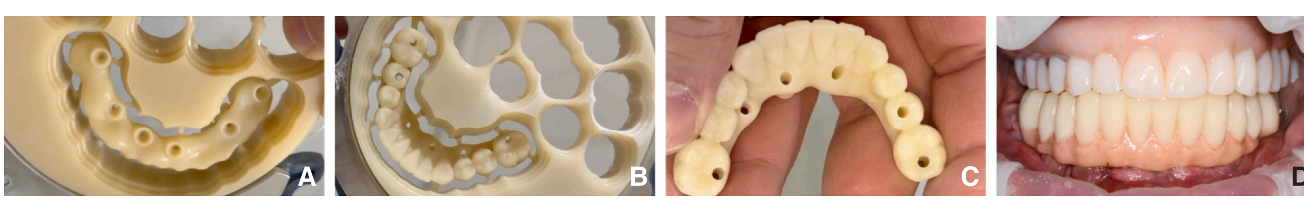

Figure 14. Milling and delivery of interim restoration. A, Milled PMMA restoration's intaglio surface. B, Occlusal surface of interim restoration in disk. C, Interim restoration after trimming and polishing. D, Clinical delivery of interim mandibular complete arch restoration with maxillary immediate denture.

surgery, the immediate denture must be modified with access openings for two anterior interim cylinders and connected to them with resin material. The distal portion is then sectioned and removed to create the anterior scanning device. Although these adjustments add time and require clinical adaptation, they are limited to two anterior implants, are familiar steps to clinicians, and do not negate the efficiency gains of the workflow.

Occlusal accuracy is another key factor. Since the denture is sectioned distal to the canines bilaterally, occlusal stops are preserved in the anterior segment. Because the immediate denture was designed based on a verified occlusion, the anterior segment provides reliable occlusal support. While a two-point anterior occlusal scan is generally sufficient to articulate the arches, potential rotational discrepancies can occur. To reduce this risk, bilateral scans extending to the canine regions can be used as an additional safeguard.

In comparison with fiducial marker protocols or relined denture scans performed extraorally, RDC 2.0 offers a more direct and less complex pathway. It requires only a preplanned, 3D printed immediate denture and eliminates the need for auxiliary markers, relining materials, or extra laboratory steps. This reduces chairside complexity and enables complete intraoral data capture within the same surgical-restorative sequence.

As with any digital technique, limitations must be acknowledged. Accuracy depends on complete capture of the scan bodies and stable soft-tissue morphology at the time of scanning. The workflow also requires familiarity with intraoral scanning and digital design software, or alternatively, access to a laboratory technician proficient in CAD design. A learning curve may be expected, and errors may occur if intraoral movement is significant or scan data is incomplete.

Despite these limitations, RDC 2.0 provides a scalable and efficient solution for complete arch implant supported restorations. Importantly, the protocol is flexible and allows integration of implant position data from multiple acquisition modalities, including intraoral scans, photogrammetry, and other digital systems.[22] Compared with hybrid methods, RDC 2.0 provides a more direct and streamlined pathway from data capture to interim delivery.[23]

RDC 2.0 introduces a cast-less digital workflow for complete arch implant-supported restorations. By leveraging an anterior scanning device and virtual articulation, this approach eliminates the need for physical casts, reference screws, and verification steps, enabling accurate, efficient, and predictable delivery of interim restorations.

Although this workflow has been tested in 4 clinical treatments with successful outcomes, clinical studies are needed to validate and refine the protocol, assess its long-term accuracy, and explore opportunities for continued improvement.

PATIENT CONSENT

Written informed consent was obtained from the patient for publication of this case and the accompanying images, in accordance with the policies of the Journal and the Declaration of Helsinki.

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We have complied with the guidelines regarding intellectual property rights, ensuring no publication barriers concerning intellectual property, in accordance with the policies of our respective institutions.

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RESEARCH ETHICS

Consent for the publication of any identifying information was obtained from all participants or their legal guardians, adhering to ethical standards.

APPENDIX A. SUPPORTING INFORMATION

Supplemental data associated with this article can be found in the online version at doi:10.1016/j.prosdent.2025.10.037.

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