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Steps for a Complete Digital Workflow for Final Anterior Dental Implant Restoration

Starting with the provisional restoration already in place after successful tissue shaping and healing, the goal is to capture accurate implant position, emergence profile, soft tissue contours, and occlusal relationships digitally to enable the lab to design and fabricate a precise, esthetically optimized final restoration (typically a custom abutment and crown, such as zirconia for anterior esthetics). This workflow minimizes chair time, reduces errors from analog impressions, and leverages intraoral scanning for high predictability in the esthetic zone. The process assumes access to an intraoral scanner (e.g., iTero, Trios, or similar), compatible scan bodies, and CAD/CAM software for lab processing.

1. Evaluate Healing and Provisional: Assess the soft tissues around the provisional for stability, health, and ideal emergence profile (the contoured transition from implant to crown that supports gingival architecture). Confirm no inflammation or recession, and evaluate occlusion and esthetics. Take intraoral photos or a facial scan for reference in digital smile design if needed for anterior harmony.

2. Capture Initial Scans with Provisional in Place: With the provisional seated, perform a full-arch intraoral scan of the implant arch to record the emergence profile, soft tissue contours, adjacent teeth, and overall anatomy. Scan the opposing arch separately. Then, perform a bite registration scan in maximum intercuspation to capture occlusion. This step preserves the conditioned soft tissue shape without risk of



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collapse. Dry surfaces thoroughly to avoid distortions from saliva.

3. Remove Provisional and Seat Scan Body: Unscrew the provisional and immediately seat a compatible scan body hand-tight into the implant. This prevents soft tissue collapse during the transition. Confirm full seating with a periapical radiograph to ensure no gaps. Ensure the scan body is oriented correctly and that adjacent contacts are accessible.

4. Extraoral 360-Degree Scan of the Provisional: Place the removed provisional on a stable holder or analog (e.g., a lab analog or scanning jig) outside the mouth. Use the intraoral scanner in extraoral mode or a dedicated desktop scanner to capture a complete 360-degree scan of the provisional, including its intaglio surface, emergence profile, and occlusal anatomy. This provides a detailed 3D model that can be used by the lab to replicate the proven contours in the final restoration design, ensuring esthetic and functional continuity.

5. Capture Scan Body and Local Site Scan: With the scan body in place, perform a targeted intraoral scan of the implant site, including the scan body geometry, surrounding soft tissue, and at least 2-3 adjacent teeth on each side for accurate merging with prior scans. Avoid scanning the full arch again unless necessary; focus on high-resolution capture of the implant position.

6. Align All Scans via Software: Using the intraoral scanner's built-in software or a compatible program (e.g., Align in iTero or Merge in exocad), superimpose and align the individual STL files. Start by aligning the scan body scan with the provisional arch scan using common reference points like



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adjacent teeth surfaces or stable landmarks. Then, incorporate the extraoral provisional scan to match contours precisely, and align the opposing arch and bite registration for occlusal accuracy. Verify the alignment for seamless integration, ensuring no offsets or mismatches in the digital model. If alignment issues persist, recapture specific scans as needed.

7. Subtract Scan Body Scan from Provisional Arch Scan:

In the CAD software, perform a Boolean subtraction operation to remove the scan body geometry (from the scan body and local site scan in Step 5) from the aligned provisional arch scan (from Step 2). This integrates the precise implant position into the model while preserving the soft tissue contours and emergence profile captured with the provisional in place, effectively creating a digital cast with optimal subgingival architecture for abutment design. Recommended software for this step includes exocad or 3Shape Dental System, as both offer robust tools for alignment, merging, and Boolean operations tailored to dental implant workflows.

8. Send Data to Lab for Digital Merging and Design:

Transmit the aligned and subtracted STL files securely to the dental lab via the scanner's portal or email. The lab will further refine the merged model if necessary, using CAD software (e.g., exocad) to virtually place the implant, select or design a custom abutment and model the final crown (often zirconia for strength and translucency in the anterior zone). Incorporate any photos or smile design inputs for shade matching and esthetic contours.

This indirect digital method for emergence profile capture is preferred for accuracy and to avoid tissue collapse, ensuring the



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final restoration mimics natural tooth contours for superior anterior esthetics. Always follow implant system-specific protocols and consult with your lab for any customizations. If adjacent teeth require modifications (e.g., veneers for harmony), integrate them into the planning.