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Protocol for Restoring an Anterior Implant from Impression or Scan, Including Provisional Shaping and Duplication of Customized Emergence Profile

This protocol outlines a step-by-step process for fabricating a final anterior implant restoration (e.g., crown) that accurately duplicates the emergence profile developed by a customized provisional restoration. The emergence profile refers to the contoured shape of the restoration where it emerges from the gingiva, ensuring natural aesthetics, gum health, and harmony with adjacent teeth. The process assumes the implant is osseointegrated and includes initial steps for shaping the provisional to condition the soft tissues, with specific additions to address black triangles (interproximal spaces) when necessary. Clear lab communication ensures precise replication of the provisional's contours for the final restoration. Use high-quality materials and verify fit at each stage to avoid discrepancies.

Shaping the Provisional to Condition Soft Tissue

The goal is to sculpt the peri-implant soft tissues to mimic the natural gingival contours of adjacent teeth, creating an ideal emergence profile for esthetics and function, while addressing black triangles when present.

1. Assess Initial Conditions:
• Evaluate the implant site post-osseointegration (typically 3-6 months after placement). Confirm implant stability, soft tissue health, and bone levels via clinical exam and radiographs.
• Take intraoral photographs (facial, occlusal, lateral) and measure gingival margins of adjacent teeth to guide provisional contouring.
• Note the desired gingival scallop, papilla height, tissue thickness, and any black triangles (visible interproximal spaces due to inadequate papilla height or tissue volume).

2. Select or Fabricate Provisional:
• Choose a temporary abutment (e.g., titanium or PEEK) compatible with the implant system. Alternatively, fabricate a custom temporary abutment using flowable composite or acrylic for precise contour control.
• Create a provisional crown (e.g., PMMA or composite) either chairside or via lab fabrication, based on a diagnostic wax-up or digital design mimicking adjacent teeth.

3. Initial Placement and Contouring:

• Seat the provisional abutment and crown (screw- or cement-retained). Ensure subgingival contours are under-contoured initially to avoid excessive tissue pressure, which could cause recession or inflammation.
• Adjust the provisional's emergence profile:
• Subcritical area (1-3 mm below gingival margin): Shape concave to allow tissue to fill in, supporting papilla formation.
• Critical area (at gingival margin): Shape convex to gently support tissue without blanching.
• Verify occlusion and interproximal contacts to prevent excessive forces on the implant.

4. Soft Tissue Shaping and Monitoring:
• Allow the patient to wear the provisional for 2-4 weeks. Assess tissue response at follow-ups (e.g., 1 week, 2 weeks). Look for stable, healthy gingiva, natural scalloping, and presence/absence of black triangles.
• Addressing Black Triangles (When Necessary):
• Evaluate Papilla Deficiency: Identify if black triangles are due to insufficient papilla height or volume between the implant and adjacent teeth. Confirm adequate bone support and tissue thickness via probing or radiographs.
• Add Material to Interproximal Contours: Apply flowable composite or acrylic to the interproximal surfaces of the provisional crown, just below the contact point, to gently push the papilla coronally. Add material incrementally (e.g., 0.5 mm layers) to avoid over-compression, which could cause tissue ischemia.
• Shape Contact Points: Adjust the provisional's interproximal contact areas to be broader and closer to the gingival margin (e.g., within 5 mm of the bone crest, per Tarnow's rule) to encourage papilla fill. Ensure the contact is tight but not overly compressive against adjacent teeth.
• Monitor Tissue Response: After adding material, wait 1-2 weeks and reassess. Look for papilla growth or reduction in black triangle size. If insufficient, add more material gradually or consider soft tissue grafting if tissue volume is limited.
• Polish and Smooth: Use fine polishing burs to smooth added material, ensuring no plaque retention areas. Verify contours mimic adjacent teeth for natural appearance.
• Adjust other contours (non-interproximal) as needed:
• Add material to under-contoured areas if tissue collapses.
• Reduce material if tissue blanches or inflammation occurs.
• Document changes with photos and notes for reference.

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5. Final Provisional Refinement:
• Once the soft tissue stabilizes (typically 3-6 months) and black triangles are minimized or eliminated, confirm the emergence profile matches the gingival contours of adjacent teeth. Ensure papillae are well-formed and the tissue appears natural.
• Take final intraoral photographs and a shade guide for the final restoration. If satisfied, proceed to impression/scan.
General Preparation (After Provisional Shaping)

1. Clinical Evaluation:
• Assess the provisional for function, esthetics, occlusion, and soft tissue health. Confirm the emergence profile, including papillae, harmonizes with adjacent teeth (e.g., no over- or under-contouring, no black triangles).
• Document with intraoral photographs (multiple angles) and shade guides for color matching. Note any minor adjustments needed for the final restoration.

2. Patient Preparation:
• Ensure optimal oral hygiene. Administer local anesthesia if needed for comfort during provisional removal and impression/scan.

3. Provisional Removal:
• Gently remove the provisional (screw- or cement-retained) without disturbing the soft tissues. Inspect the implant-abutment connection for stability. Proceed immediately to impression/scan to capture the profile before tissue collapse.
Conventional Workflow (Analog Impression)
This method uses a custom impression coping to transfer the emergence profile to a physical model.

1. Fabricate Custom Impression Coping:

• Attach the removed provisional to an implant analog outside the mouth.
• Embed the provisional-analog assembly in polyvinyl siloxane (PVS) putty or wash material to the depth of the cervical third of the crown, capturing subgingival contours, including interproximal areas shaped to eliminate black triangles. Mark the facial surface for orientation.
• Unscrew and remove the provisional, leaving the analog in the putty.
• Attach an open-tray impression coping to the analog.
• Fill the space around the coping with pattern resin or flowable composite to replicate the provisional's emergence profile, including interproximal contours. Remove excess material and ensure smooth transitions.

2. Take the Impression:
• Seat the custom impression coping intraorally on the implant, verifying fit and orientation.
• Use a closed- or open-tray technique with PVS or polyether impression material to capture the full arch, opposing arch, and bite registration. Ensure the custom coping accurately records the soft tissue socket, including papillae, without distortion.

3. Model Fabrication:
• Pour the impression in Type IV dental stone to create a master cast with a removable soft tissue analog (e.g., gingival mask material) that replicates the captured emergence profile and papillae.

4. Verification:
• Try in a verification jig or scan the model digitally (if hybrid workflow) to confirm accuracy of the profile and interproximal contours.
Digital Workflow (Intraoral Scan)
This method uses multiple coordinated scans to digitally capture and merge data for precise transfer.

1. Initial Soft Tissue Scan:

• Immediately after provisional removal, perform a full-arch intraoral scan (e.g., using iTero, TRIOS, or CEREC) to capture the open soft tissue socket, emergence profile, and papillae before collapse.
2. Scan with Scan Body:
• Attach a compatible scan body to the implant.
• Perform a second full-arch scan, capturing the scan body position, adjacent teeth, papillae, and occlusion. Also scan the opposing arch and bite.
3. Scan the Provisional:
• Assemble the removed provisional on a lab analog extraorally.
• Scan the provisional-assembly to capture its full contours, including interproximal areas shaped to eliminate black triangles, with a positioning reference (e.g., cylindrical extension matching the implant diameter).
4. Data Merging:
• Import all scans into CAD software (e.g., exocad, 3Shape).
• Superimpose the scans: Align the soft tissue socket scan with the scan body scan for implant position, then overlay the provisional scan to transfer its emergence contours, including interproximal papilla support, digitally.
Lab Communication (Applies to Both Workflows)

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To ensure exact duplication of the provisional's emergence profile, including papillae, for natural appearance and matching adjacent teeth:

1. Provide Comprehensive Data:

• For conventional: Send the physical impression/master cast, custom coping, original provisional, diagnostic wax-up (if available), and poured models with soft tissue replicas showing papillae.
• For digital: Export STL files of all scans (merged dataset if possible), including the soft tissue socket, scan body position, and provisional contours with interproximal shaping.

2. Written Instructions:

• Specify: "Duplicate the emergence profile from the provided provisional/soft tissue scan exactly, including subcritical (concave) and critical (convex) contours, and interproximal areas shaped to eliminate black triangles for natural gingival scallop and harmony with adjacent teeth. Match shade [e.g., A2] and translucency for anterior esthetics. Use [e.g., zirconia abutment with lithium disilicate crown] for final restoration."
• Include desired abutment type (custom vs. stock), restoration material (e.g., layered ceramic for natural opacity), and any modifications (e.g., "Maintain interproximal contacts to support papillae as in provisional").

3. Supporting Materials:

• Send intraoral photos (highlighting papillae), shade guides, and bite registration.
• Request a try-in abutment or bisque-bake stage for verification of emergence, papilla support, and esthetics before final glazing.

4. Collaboration:

• Use secure digital portals (e.g., lab software integrations) for real-time feedback. If discrepancies arise, request revisions with specific notes (e.g., "Increase interproximal contour by 0.3 mm to match #9 papilla").

Final Delivery (Applies to Both Workflows)

1. Try-In:

• Seat the custom abutment and final restoration. Verify emergence profile, papilla support, occlusion, contacts, and esthetics. Confirm no black triangles remain. Adjust as needed and rescan/reshade if necessary.

2. Insertion:

• Torque the abutment to manufacturer specs (e.g., 35 Ncm). Cement or screw-retain the crown, ensuring no excess cement. Polish for smooth transitions.

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3. Follow-Up:

• Schedule recalls at 1 week, 3 months, and annually to monitor soft tissues, papilla stability, and profile integrity.

This protocol, with detailed provisional shaping to eliminate black triangles, ensures the soft tissues are conditioned for an ideal emergence profile, which is accurately transferred and replicated in the final restoration for optimal esthetic and functional outcomes.