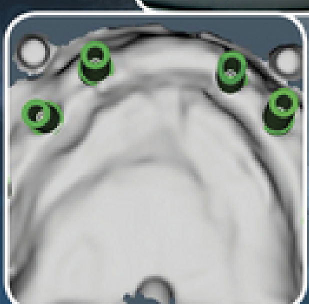
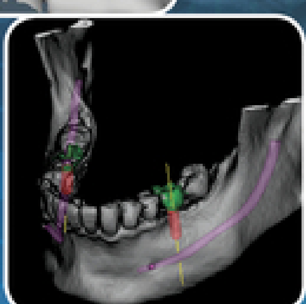
Clinical Applications of Digital Dental Technology





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Chapter 7: Digital Implant Surgery

Figure 7.9 Pettersson *et al.*, (2010). (Figure 4, page 533. Reproduced with permission of John Wiley & Sons, Inc.)

Figure 7.10 Technique described by Fortin (2006). (a) Implants are placed using guided surgery to avoid a sinus elevation procedure. (b) A bone recipient site close to and parallel to the sinus wall is prepared to avoid bone augmentation.

Figure 7.11 Single-scan systems. (a) Step 1. The master cast represents the patient situation and is the basis for the production of the scan and surgical guide. (b) Step 2. The scan guide contains information about the desired prosthetic outcome in the form of radiopaque teeth (visible in CT/CBCT scan). The scan guide is connected to a plate containing reference landmarks (in this particular example three pins) in order to ensure the link between digital implant planning and surgical guide fabrication. (c) Step 3. The patient is scanned wearing the scan guide with a commercially available 3D CT/CBCT scanner. (d) Step 4. The user can import the 3D dataset (DICOM) directly into the planning software. The implant is positioned with respect to the patient's anatomy and the desired prosthetic outcome. After completion of the implant planning, the software provides the plan for surgical guide production (Laboratory-based, milled or printed) and the surgical plan for the guided surgery kit (explaining step by step the drilling sequence). (e) Step 5. The surgical guide is produced according to the guide plan provided by the planning software. The surgical guide contains the surgical sleeves that guide the surgical instruments and the implant.

Figure 7.13 Surgical procedure. (a) Clinical and radiographic examination precedes every implant treatment procedure. (b) In this particular case, an atraumatic extraction with simultaneous implant placement is performed. (c) The surgical guide, fabricated with the help of the software Sicat, is inserted. (d) For the osteotomy, the company provides the sequence of drills that needs to be used. (e) Each drill is inserted through the hole of a drill handle that has a matching diameter. (f) After the drilling process, the surgical guide is kept in place. (g) A partially guided implant placement, without a handle, is performed. (h) The implant is placed in the prosthetically desired position. (i) The gap between the buccal bone and the implant surface is filled with a xenograft. (j) A provisional crown fabricated before implant placement is delivered immediately after surgery.

Figure 7.14 Flapless placement and immediate restoration of a single implant. (a) Patient presents with a congenitally missing left lateral incisor. (b) A laboratory-based radiographic guide with 3 reference pins in the plate is used (templiX™). (c) Bone volume is assessed. A 3.3 x 12 mm bone level implant is selected. (d) By using a computer-aided surgery software, the implant is digitally placed in reference to the position of the final restoration and the crestal bone. (e) A laboratory-made surgical guide is used to drive implant placement. (f) A flapless approach is selected and a soft tissue pouch removed with a specific instrument present in the Straumann® guided surgery cassette. (g) An osteotomy is created by drilling through the drill handles and the metallic sleeves present in the surgical guide. (h) The implant placement is fully guided by using a special transfer piece with reference lines. (i) The final crown is delivered the same day of the implant placement. A connective tissue graft is sutured in place to compensate the horizontal defect at the level of the lateral. (j) Healing after 4 weeks shows adequate papilla fill in the interproximal areas.

Figure 7.15 Immediate placement and restoration of single implant. (a) Patient presents with chief complaint: “I want a solution for the infection that I have in my tooth, and I don't want to have a hole”. His esthetic expectations are high. (b) The right first premolar needs to be extracted for restorative reasons. (c) A special plate with radiopaque landmarks is used for the radiographic guide. (d) 3D reconstruction of the patient's maxillary bone and implant. (e) SICAT surgical software planning is used for virtual implant placement. (f) Presurgical intraoral view. (g) After an atraumatic extraction, the buccal bone integrity is verified and an immediate implant placement performed with guided surgery. (h) A 4.1 × 12 mm implant (Klockner®) is fully guided through the 5 mm sleeve. (i) After implant placement, a prefabricated provisional crown is delivered. (j) Final restoration at the 2-year follow-up. (k) The soft tissue and the color of the crown are in excellent harmony with the natural dentition. (l) A 2-year postoperative CBCT shows maintenance of the buccal bone.

Figure 7.16 Guided placement and immediate loading of implants in edentulous maxilla. (a) The patient presents wearing an acrylic RPD. She wants a fixed restoration. (b) The future implant position is planned in the diagnostic and treatment planning phase. (c) The validated initial setup is used as a guide for the fabrication of the radiographic guide. A bite plate