

Use of transitional implants to support a surgical guide: Enhancing the accuracy of implant placement

Harel Simon, DMD^a

School of Dentistry, University of California at Los Angeles, Calif.

Surgical guides for edentulous patients often lack the stability desired for accurate implant placement. The difficulty is emphasized in the edentulous mandible when implant-supported metal-ceramic restorations, which require precise placement of implants, are planned. A technique is presented for the fabrication of a surgical and radiographic template, supported by transitional implants, that guides the placement of conventional implants. This template can enhance placement accuracy in an efficient way to achieve predictable, esthetic results. (*J Prosthet Dent* 2002;87:229-32.)

Optimal implant placement is ultimately determined by the requirements of the final prosthesis.¹ The use of a surgical template has been advocated to achieve predictable prosthetic results through accurate implant placement.² A surgical template for a partially edentulous patient is usually supported by the adjacent teeth. However, in an edentulous patient, the surgical template has to be stabilized by the remaining tissues. This template is usually fabricated from clear polymethyl methacrylate through duplication of the patient's complete denture or from the diagnostic wax-up. The template is relieved from the lingual or palatal aspect to allow for surgical access, and the buccal flanges are shortened to allow room for the reflected mucoperiosteal flap.^{2,3}

To achieve optimal results, the surgical guide must possess adequate inherent stability despite the cut-away segments. The maxillary template can be supported by the palate and the tuberosities. The mandibular template, however, must be relieved at the buccal flanges to allow for flap reflection, be open at the lingual aspect to allow accessibility to the surgical site, and be virtually supported by the retromolar pads (Fig. 1). Inherently, this template will display some amount of mobility and therefore potential inaccuracy.⁴ Although the tissue-supported surgical template is traditionally used with acceptable results when implants are placed to support overdentures or hybrid fixed complete dentures,^{2,3,5-9} it may not provide the precision desired for metal-ceramic, implant-supported fixed prostheses.⁴

Transitional implants were introduced as alternative means of supporting the provisional restorations of patients undergoing implant therapy.¹⁰⁻¹³ These implants usually are placed at the time of conventional implant placement. However, they also can be placed at the time of extraction to provide the patient



Fig. 1. Tissue-supported surgical template for implant placement in edentulous mandible.



Fig. 2. Transitional implants strategically placed away from future location of conventional implants. Impression copings placed on transitional implants.

with an immediate fixed restoration.¹¹ When properly planned, transitional implants can offer a significant benefit by supporting radiographic and surgical templates for the conventional implants. Nonetheless, it may be challenging to properly place conventional implants between the transitional ones and to fabricate

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^aResident, Advanced Prosthodontics.

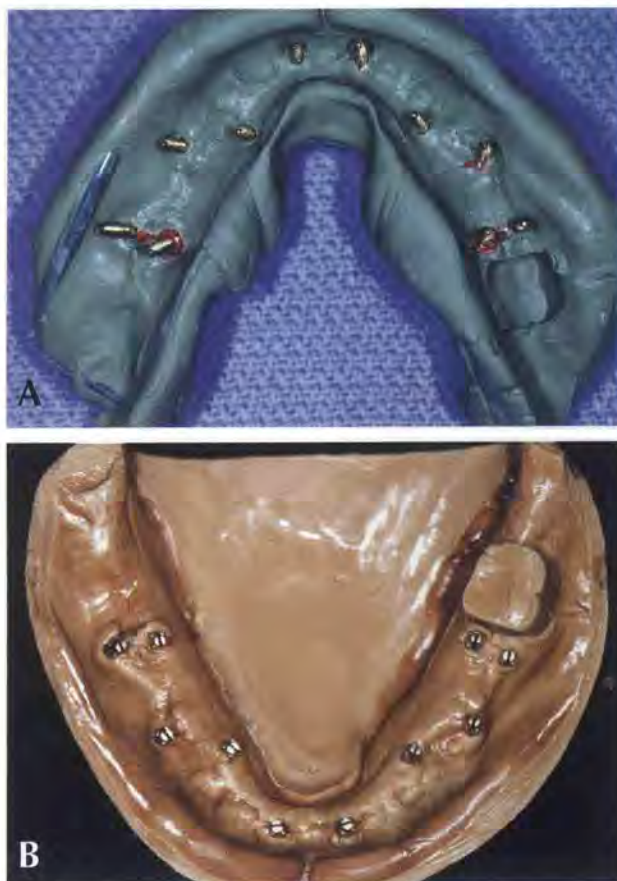


Fig. 3. A, Transitional implant analogues connected to impression copings. B, Mandibular cast with transitional implant analogues.

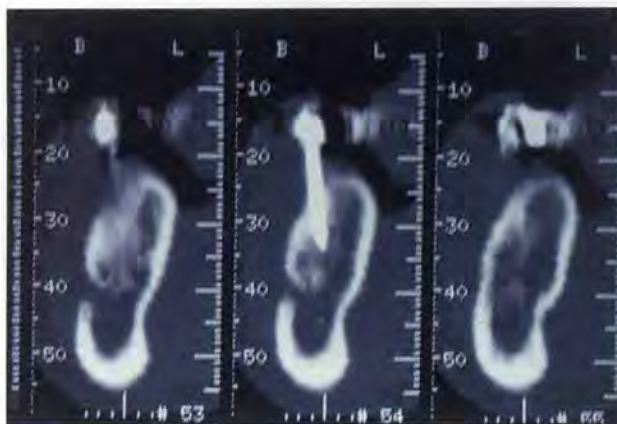


Fig. 5. Computerized tomography scan performed with radiographic template demonstrates transitional implant placed labial and mesial to conventional implant site marker.

radiographic and surgical templates utilizing these transitional implants.

This article describes the clinical use of transitional implants to support a surgical and radiographic template for accurate implant placement in edentulous



Fig. 4. Radiopaque markers placed in tentative implant sites.

patients. A technique for fabrication of these templates is described.

TECHNIQUE

Approximately 2 months after extraction and simultaneous placement of transitional implants (MTI; Dentatus USA, New York, N.Y.), the provisional prosthesis is removed. The soft tissue has healed, and the patient is ready for conventional implant placement.

1. Place transitional implant impression copings on the implants (Fig. 2), and make a pick-up impression with high-viscosity vinyl polysiloxane (Reposil; LD Caulk Inc, Milford, Del.).
2. Connect transitional implant analogues to the impression copings (Fig. 3, A), and pour the impression in low-expansion dental stone (Resin Rock; Whip Mix Corp, Louisville, Ky.) (Fig. 3, B).
3. Place prosthetic copings (Singular Coping, MTI; Dentatus USA) on the implant analogues. Confirm proper seating.
4. Create a vacuum-formed matrix from a duplicate cast of the diagnostic wax-up, and evaluate the matrix on the transitional implant cast to verify proper adaptation and orientation.
5. Pour clear autopolymerizing polymethyl methacrylate resin (Teets autopolymerizing denture material; Co-Oral-ite Dental Manufacturing Co, Diamond Springs, Calif.) into the vacuum-formed matrix, and seat it on the cast to fabricate the radiographic template. To ensure proper orientation and stability, a minimum of 3 copings should support the template in a tripodized fashion. The contours of this template simulate the design of the final restoration.
6. Place radiopaque markers made of gutta percha (Kerr Corp, Orange, Calif.) in channels prepared for tentative implant sites (Fig. 4).
7. Coat the template with barium sulfate powder



Fig. 6. A, Radiographic template converted to surgical template. Note transitional implant locations, which were planned prior to extraction to allow optimal conventional implant placement. **B,** Surgical template supported by transitional implants.

mixed with light-polymerized resin (Triad VLC bonding agent; Dentsply, York, Pa.), and allow the mixture to polymerize in a light-activation unit (Triad; Dentsply).

At the next clinical visit, insert the radiographic template and obtain a computerized tomography scan of the patient (Fig. 5).

After thoroughly analyzing the clinical and radiographic findings, select implant sites and convert the radiographic template to a surgical template (Fig. 6, A). Polish away the barium sulfate to reestablish visibility through the clear template. Trim the template to allow accessibility of surgical instruments through the lingual aspect.

10. At the surgical visit, insert the template and use it to guide implant placement (Fig. 6, B). The template will be completely stabilized by the transitional implants, and the surgeon should be able to achieve optimal accuracy. The template also will provide maximum accessibility with enhanced visibility of implant sites (Fig. 7, A).
11. Upon completion, suture the surgical site and



Fig. 7. A, Accurate implant placement facilitated by template. **B,** Restoration cemented on transitional implants upon completion of surgery.

deliver the same provisional to the patient (Fig. 7, B).

DISCUSSION

In a retrospective evaluation, it was found that significantly fewer implants were placed outside the planned site when fixed surgical templates rather than soft tissue-supported templates were used.⁴ In addition, a significantly higher coincidence was observed between the "ideal" position and the actual position of implants in the fixed maxillary template group. Since the mandibular template is generally less stable than its maxillary counterpart, the benefit of a fixed radiographic and surgical template would be even more significant in the mandible.

The use of proprietary microimplants to support a surgical template has been suggested.⁴ Transitional implants remain an attractive choice because they not only offer support for a surgical template but also provide immediate provisionalization throughout implant therapy.

The importance of adequate positioning of implants is demonstrated in Figure 7. Proper planning is essential to locate tentative conventional implant sites

before the procedure and guide placement of the transitional implants away from those designated sites. A preliminary surgical template based on the diagnostic wax-up should be used initially to guide the placement of the transitional implants.

Avoidance of early removal of cement-retained provisional restorations has been recommended when the supporting implants have been subjected to immediate loading.¹⁴ Long-term provisional cement is, therefore, traditionally advocated with the use of transitional implants.^{11,13} Nevertheless, if the provisional restoration must be removed to allow for conventional implant placement, it should be luted initially with a temporary cement (Tempbond; Kerr) to minimize trauma to the transitional implants upon removal. Thereafter, the restoration may be luted with a long-term provisional cement such as polycarboxylate cement.

SUMMARY

This article described the fabrication and use of an accurate surgical template supported by transitional implants. The use of transitional implants requires meticulous treatment planning and additional chair-time. However, when used properly, transitional implants can provide support for an immediate fixed restoration and facilitate accurate implant placement with improved stability of the surgical template and enhanced visibility of the surgical sites.

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Reprint requests to:

DR HAREL SIMON
1400 MIDVALE AVE, SUITE 101
LOS ANGELES, CA 90024
E-MAIL: sims1@hotmail.com

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