

A maxillary screw-retained, implant-supported diagnostic wax pattern

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This article describes the fabrication of a screw-retained, implant-supported wax pattern that enables the restorative dentist to predict the outcome of the final prosthesis. The wax pattern also affords the patient an opportunity to evaluate and approve the design of the planned prosthesis, thereby enhancing communication between the dentist and patient. (J Prosthet Dent 2002;87:403-6.)

Dental implants have become an established treatment modality for the totally^{1,2} and partially edentulous patient.^{3,4} While the placement of a full-arch, fixed, implant-supported mandibular prosthesis has been associated with a 98.9% surgical and prosthetic success rate after 12 to 15 years of function,⁵ full-arch, maxillary implant-supported fixed prostheses have been associated with esthetic and/or phonetic difficulties.⁶⁻¹¹ The need for adequate lip support and the degree of maxillary alveolar ridge resorption often determine the potential for fabricating a fixed maxillary prosthesis.^{7-11,15,16} When advanced maxillary alveolar ridge resorption is present and there is an increased demand for lip support for esthetic purposes, a maxillary implant-supported overdenture appears to be the treatment of choice.^{9-11,15,17} One potential problem, however, is that the incorporation of a flange in a fixed maxillary prosthesis may compromise access for oral hygiene.⁷⁻⁹

This article describes the fabrication of a screw-retained, implant-supported wax pattern. The pattern can be used by both dentist and patient to evaluate the design of a planned prosthesis.

TECHNIQUE

A 52-year-old Asian female patient presented at the Center for Prosthodontics and Implant Dentistry at Loma Linda University seeking treatment for her completely edentulous maxilla. After various treatment options were discussed, the mandible was planned for restoration with a conventional fixed partial denture, with the 2 canines used as the primary abutments and implants placed in the mandibular right and left first molar areas. Eight threaded, HA-coated root-form implants (Steri-Oss; Nobel Biocare USA, Yorba Linda, Calif.) were placed in the maxillary arch. Implant placement and postoperative healing occurred without complication.

The following clinical and laboratory steps were followed to fabricate the definitive maxillary cement-retained, implant-supported fixed prosthesis.

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Fig. 1. Maxillary master stone cast with simulated soft tissue. Note 2 non-hexed temporary implant abutments (crowns).



Fig. 2. Autopolymerizing acrylic resin used as "framework" for fabrication of wax pattern. Two nonhexed temporary abutments are placed at most distal implants to provide support to acrylic resin framework.

1. Pour the master impression with a tissue-colored condensation polysiloxane (Gi-Mask; Coltene AG, Altstätten, Switzerland) to simulate the soft tissue (Fig. 1).¹²
2. Place 2 nonhexed temporary implant abutments in the most distal implant analogues. Reduce the



Fig. 3. Wax applied around acrylic resin framework to form wax pattern.



Fig. 4. Implant-supported, screw-retained wax pattern evaluated intraorally.



Fig. 5. Esthetics, adequate lip support, phonetics, occlusion, and cleansibility evaluated intraorally.

height of the abutments according to the available interocclusal space. Place autopolymerizing acrylic resin (Pattern resin; GC America Inc, Alsip, Ill.) around the temporary abutments, and extend it around the contour of the maxillary arch to provide a framework for the fabrication of the wax pattern (Fig. 2).

3. Fabricate the screw-retained, implant-supported wax pattern by applying wax (Pro-art; Williams, Amherst, N.Y.) around the framework (Fig. 3). Evaluate the occlusion on the articulator, and provide adequate space for oral hygiene at the interproximal areas. Provide single-tooth distal cantilevers bilaterally.¹³
4. Place the wax pattern intraorally, and screw-retain it at the area of the most distal implants (Fig. 4). The pattern resin may need additional rest support in the anterior area; however, when esthetics are evaluated, the access hole for the temporary abutments may preclude the fabrication of a full contoured wax pattern. If occlusion is a major

consideration, an additional abutment on the anterior implants should be included.

5. Evaluate esthetics, phonetics, lip support, and oral hygiene access (Fig. 5).
6. Place the wax pattern on the stone master cast, and fabricate a silicone matrix (Lab-putty; Coltene/Whaledent Inc, Mahwah, N.J.). Use the silicone matrix to fabricate the custom abutments (Fig. 6, A) and the metal framework of the prosthesis. The matrix will provide guidance for the cut-back of the wax to ensure adequate and even ceramic thickness (Fig. 6, B).
7. Insert the definitive cement-retained, implant-supported prosthesis (Fig. 7), and lute it to the custom abutments with temporary non-eugenol cement (Temp-Bond; Kerr, Romulus, Mich.).¹⁴

DISCUSSION

The described technique allows both dentist and patient to evaluate the esthetics, phonetics, contours, and cleansibility of a planned implant-supported fixed prosthesis. It also enables the dentist to evaluate the occlusal plane and vertical dimension of occlusion and to confirm the interocclusal records made during the previous appointment. The wax pattern offers the flexibility to alter contours, tooth alignment, and dimensions until esthetic expectations are met. The wax pattern is evaluated chairside; a duplicate of it in the form of a provisional screw-retained transitional prosthesis can give the patient and dentist more time, if needed, to assess the aforementioned parameters (esthetics, contours, and so on).

The fabrication of a silicone matrix based on the screw-retained, implant-supported wax pattern enables proper milling of the custom abutments to achieve the correct emergence profile of the permanent restoration (Fig. 6, A).¹⁸ The custom abutments can be milled at or below the gingival level to enhance the

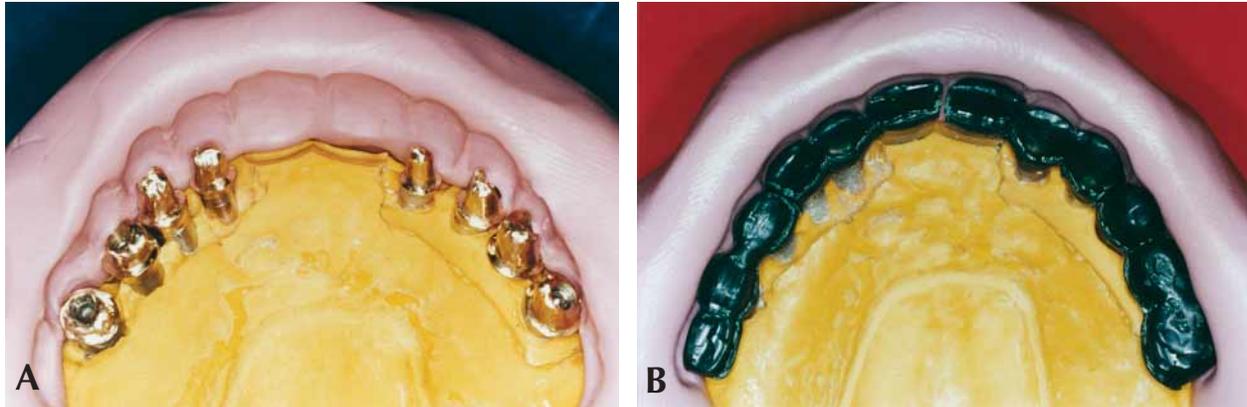


Fig. 6. A, Silicone matrix used for fabrication of metal framework of definitive prosthesis. **B,** Wax pattern used to fabricate silicone matrix used during fabrication of custom abutments.

esthetics,¹⁸⁻²⁰ provided that adequate gingival thickness is available around the platform of the implants.^{9,18} Alternatively, a duplicate of the screw-retained wax pattern can be used to fabricate a vacuum stent that can be used to evaluate the lingual and incisal/occlusal areas and the labial/facial contours.

The described technique is intended for use after second-stage surgery, when the osseointegrated implants can provide retention and support for the diagnostic wax pattern. This support ensures that the definitive prosthesis can be fabricated with precision and predictability. Preoperative diagnostic evaluation allows limited precision because of the lack of stability of the diagnostic wax-up. For the patient described in this article, a duplicate of the newly fabricated complete denture was used as a surgical template for the placement of implants. Some of the implants in the anterior area (Fig. 2) were placed too far labially, presumably because the surgical template was unstable when full-thickness labial/palatal flaps were reflected.

Several authors have used denture teeth placed on an acrylic resin baseplate^{6,15,16} to fabricate a diagnostic silicone jig in the laboratory. Denture teeth do not offer the precision of a fully contoured diagnostic wax-up. In addition, the presence of a baseplate does not allow the clinician to evaluate accessibility for oral hygiene and the need for lip support when a fixed prosthesis is planned. Removable gingival veneers have been proposed^{21,22} when the necessity for lip support is not assessed during the diagnostic restorative phases.

The definitive prosthesis described in this article was cemented because cemented prostheses can offer superior esthetics^{23,24} and a reduced occurrence of abutment screw loosening.²⁴ It has been shown that irretrievability is possible with cemented prostheses.¹⁴ However, if a screw-retained, implant-supported prosthesis is planned, the described screw-retained wax pattern offers the opportunity to evaluate, through the



Fig. 7. Definitive cement-retained, implant-supported prosthesis.

silicone matrix, the feasibility of fabricating a screw-retained prosthesis. This is important given that buccally or labially misangulated implants preclude the fabrication of a definitive screw-retained prosthesis. In those situations, appropriately modified custom abutments can help correct implant misangulation.¹⁸ The screw-retained wax pattern described in this article also can be used with screw- or cement-retained and implant-supported fixed partial dentures for partially edentulous patients.

SUMMARY

The screw-retained, implant-supported wax pattern described in this article is a diagnostic tool that enables the restorative dentist to predict the outcome of the final prosthesis. The wax pattern also affords the patient an opportunity to evaluate and approve the design of the planned prosthesis, thereby enhancing communication between the dentist and patient.

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