

Preoperative auricular wax pattern duplication for surgical template fabrication

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Craniofacial implants have been shown to provide excellent stability and retention for auricular prosthodontic rehabilitation. The locations of implant placement are critical to achieve optimal prosthetic results. This article describes a procedure for fabricating a surgical template from a diagnostic wax-up of an ear without destroying the wax pattern. A full-contour template can assist in proper positioning of craniofacial implants, which in turn can complement the prosthetic result. (*J Prosthet Dent* 1999;81:634-7.)

Loss of an auricle results from trauma, congenital disease, or surgical ablation of benign or malignant tumors. The disadvantages of using adhesive-retained auricular prostheses are less than optimal for predictable retention and difficulty in orientation of a prosthesis by the patient.^{1,2} An implant-retained auricular prosthesis is an option that can be considered instead of surgical reconstruction.^{3,4} The application of craniofacial implants for facial disfigurement was first reported by Tjellström.⁵ The benefits of using an implant-retained facial prosthesis versus a conventional prosthesis for a patient's psychological well-being have also been documented.^{6,7}

The location and orientation of craniofacial implants is critical to achieve an optimal prosthetic result. Preimplant treatment planning is essential to coordinate the patient's surgical and prosthodontic management. A full-contour surgical template assists the surgeon in determining the required location of implants relative to the anticipated prosthesis's orientation.

This article describes a procedure to duplicate a diagnostic wax contour of an auricle for a surgical template fabrication before implant placement.

PROCEDURE

1. Make mouldage impressions of both the unaffected auricle and the tissue base of the missing auricle using either an irreversible hydrocolloid or an elastomeric impression material.
2. Pour the impressions with dental stone and properly trim the casts.
3. Sculpt a diagnostic wax-up of the ear prosthesis on the working cast (Fig. 1) to create a mirror image of the opposite ear.
4. Try the wax ear prosthesis on the patient and modify the size, shape, and orientation of the wax ear (Fig. 2).
5. Create indexes on the wax contour of the ear to easily identify its orientation in relation to the



Fig. 1. Diagnostic wax pattern contour of ear on working cast.

patient's anatomic landmarks, namely, external auditory canal, posterior, superior, and inferior borders of the remaining tragus (if present).

6. Use 3 to 4 utility wax strips (1.5 inches in length) as sprues. Place the sprues at the highest and lowest areas of the wax ear (Fig. 3).

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Fig. 2. Wax ear try-in on defective side. Indexes are made in relation to patient's anatomic landmarks: tragus and external auditory canal.

7. The sprued wax ear should be stabilized with a small piece of utility wax in a denture cup such that the anterior border of the ear and the helix are at the same horizontal level.
8. Mix irreversible hydrocolloid impression material (Caulk/Dentsply, Milford, Del.) in a vacuum mixer with water to powder 1:1 ratio by volume and pour the impression material to fill the denture cup just to the level of the anterior border of the wax ear. No impression material should go over to the ear lobe, concha, and antihelix.
9. Wait until for the irreversible hydrocolloid to set and use a knife to create 3 triangle indexes on the alginate surface (Fig. 4).
10. Inject light body addition silicone impression material (Reposil, Caulk/Dentsply) onto the wax ear to cover the entire wax ear. If the light body impression material tends to slump from the higher areas, such as helix and antihelix, to the lower areas (triangular fossa and concha areas), then a thin layer of regular addition silicone impression material (Reposil, Caulk/Dentsply) can be added on top of the light body impression material so that the entire wax ear can be covered evenly by the impression materials.

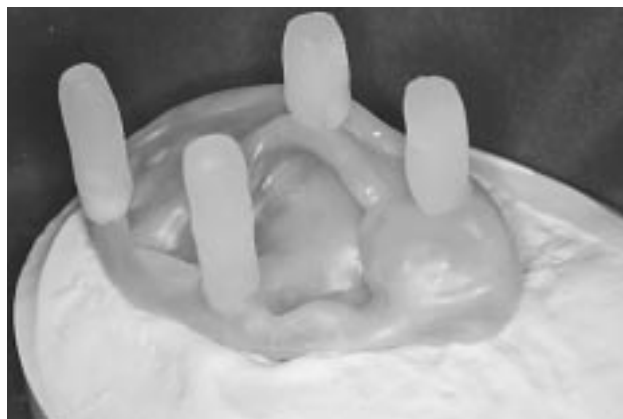


Fig. 3. Four wax sprues are attached to wax patterned ear to ensure proper access and venting during injection of acrylic resin.



Fig. 4. Top view of first part of impression mold made of irreversible hydrocolloid impression material. Impression material was poured only to level of anterior border of wax ear.

11. Paint liquid impression tray adhesive (Hold, Tele-dyne Waterpik Inc, Fort Collins, Colo.) on the addition silicone material, and pour alginate material to fill the denture cup.
12. After the irreversible hydrocolloid impression material has set, retrieve and remove the wax ear and sprues from the denture cup by separating the upper and lower parts of the mold (Fig. 5).
13. Reorient the upper and lower parts of the impression material molds by matching the indexes. Put both parts back into the plastic denture cup.
14. Mix autopolymerizing resin powder and liquid (Orthodontic resin, Hygenic Corp, Akron, Ohio) in a 1:1 ratio and pour the acrylic resin into a 5-cc plastic syringe (Monojet, Sherwood Medical Inc, St. Louis, Mo.). When the acrylic resin is in a low



Fig. 5. Wax ear is removed from impression mold. Upper and lower portions of molds can be reassembled by indexes.

viscous state, inject the material into the sprues until acrylic resin fills the mold spaces. (The acrylic resin should be injected into the sprue where it is attached to the highest level of the wax ear to ensure all the spaces are filled without any voids.)

15. Retrieve the acrylic resin ear after the material has completely polymerized.
16. Trim away the excess material and sprues.
17. Use no. 6 acrylic resin bur (no. 257EF bur, Braseler USA Inc, Savannah, Ga.) to make a trough (groove) from the 11 o'clock to 7 o'clock position along the antihelix area for the right ear template and from the 1 o'clock to 5 o'clock position for the left ear template. (Figure 6 depicts a wax ear and the duplicated surgical template with a hollowed out area. The trough represents the area the implants will be placed.)
18. Properly finish and polish the acrylic resin ear. Soak the template in a disinfectant (Cidex Plus, J & J Medical, Skillman, N.J.) before sending to the operating room for the surgical implant placement procedure.

DISCUSSION

The addition silicone impression material can be sandwiched between irreversible hydrocolloid materials for the 2-piece molds of wax ear duplication because it is flexible and has much better tear resistance. If a 2-piece mold used with an irreversible hydrocolloid impression material for wax ear duplication, the material will be always torn during the wax ear retrieval step, because there are many deep undercuts and an irreversible hydrocolloid impression material is not strong enough. If a 3-piece mold is made of irreversible hydrocolloid only, the second piece is usually small and fragile.

This duplication method also preserves the diagnostic wax ear that can be modified later for the final contour and ear mold fabrication. In so doing, many hours of sculpting the ear again can be saved. Clay material is



Fig. 6. Identical acrylic resin surgical template is duplicated from wax ear. Trough is made for implant location and hole

not recommended for diagnostic ear sculpting because it lacks rigidity and will likely be destroyed during the duplication procedure when retrieving the ear from the impression mold.

Although the tissue base adjacent to the implant areas may be altered at the time of final prosthesis fabrication, the preserved wax ear can be clinically modified and attached to the acrylic plate that is designed to mechanically retain the silicone ear prosthesis through a magnet or a gold bar/clip system. A hot wax spatula can be used to remove some of the base of the wax ear at chair side. Soft utility wax, slightly softened in a warm bath, can be placed on the base of the wax ear. The clinician can then confirm the proper orientation and angulation of the wax ear in relation to the patient's face and then subsequently seal the utility wax to the acrylic resin plate. The wax ear can be transferred with the acrylic resin plate to the working cast. The final adaptation of the wax ear with the acrylic resin base to the soft tissue base on the stone cast can be completed at this stage and can be performed in a clinical setting without much effort. The implant-retained ear prosthesis does not require all tissue surfaces of the prosthesis to closely contact the skin underneath. It is recommended that a 2 to 3 mm open space be left in the posterior region of the ear prosthesis for venting or "breathing." The only place that needs to have a good seal is the anterior region of the prosthesis for cosmetic reasons.

The advantages of the method are the accurate duplication of a diagnostic wax ear for the surgical template fabrication and the sculpting procedure for the final ear prosthesis is shortened. The method also offers 2-piece molds rather than commonly used 3-piece molds for surgical template fabrication. The disadvantages of the technique are that it is time-consuming

(approximately 1 hour of laboratory time required) and more costly than an all-irreversible hydrocolloid duplicating procedure because of the cost of the silicone impression materials.

SUMMARY

An implant-retained auricular prosthesis has been demonstrated to be a better choice over adhesive-retained ear prostheses. Properly located implant placement is important for the final prosthetic result. Preoperative planning and surgical template fabrication are critical for attaining clinically acceptable results and the patient's satisfaction. A surgical template provides information for the surgeon to assist in locating implant positions. This article outlines a procedure for the fabrication of an acrylic resin surgical template that is duplicated from a diagnostic wax ear. The advantage of this procedure is to preserve the wax pattern of the ear for the final fabrication of an implant-retained auricular prosthesis.

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