

Fabrication of a craniofacial implant surgical and treatment planning guide

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A procedure is described to fabricate a surgical guide to assist in the placement of craniofacial implants for prosthetic auricular rehabilitation. An impression is made of the defect, and a wax pattern of the missing ear is completed and evaluated on the patient. The definitive wax prosthesis is processed in acrylic resin. An occlusal maxillary splint is also fabricated. The occlusal splint and the acrylic resin ear are joined together using an extraoral acrylic resin bar. The resulting surgical guide provides proper orientation of the acrylic resin ear while remaining securely attached to the maxillary arch. This surgical guide can also be utilized for pretreatment radiographic examination. (J Prosthet Dent 2005;93:91-4.)

A silicone auricular prosthesis is an acceptable alternative restoration after surgical reconstruction has failed to achieve an esthetically pleasing result.¹ The prosthetic treatment plan should be completed before proceeding with the removal of the surgically reconstructed ear. Fabrication of the surgical template is an important preprosthetic requirement.² This article describes the fabrication of a surgical guide that also serves as a radiographic guide. An important distinction of the surgical guide is the relationship to the maxillary teeth. This helps to eliminate improper implant placement by the surgeon at the time of surgery.

Patients requiring implant-retained auricular prosthetic rehabilitation may not have the necessary anatomy to allow proper implant placement. During surgery the tissue is reflected, and proper placement of the surgical template may be impossible. The surgical template ideally should be attached to fixed anatomical references to minimize any error that may result in incorrect implant placement. Without an attachment to fixed anatomical references, the surgeon may be misled by a malpositioned surgical guide.

Fabrication of an acrylic resin duplicate of the definitive prosthesis has been described by Asher et al.³ If anatomy does not allow for implant placement as directed by the prosthodontist or anaplastologist, a 3-dimensional replica of the definitive prosthesis allows the surgeon to select an appropriate alternative site. A 3-dimensional template should be used whenever possible. The use of a modified ear face-bow that connects an acrylic resin ear to the earpiece of a face-bow was described by Tan et al.⁴ The procedure described in this article combines the treatment concepts presented by Asher et al.³ and

Tan et al.⁴ The occlusal splint allows the surgical guide to be used during all phases of surgery. The acrylic resin ear can be predictably positioned after tissue reflection, and the surgeon may visualize the correct placement directly on the bone.

Fabrication of the radiographic and surgical template is a rapid procedure that provides valuable information prior to and during surgery. The purpose of this article is to describe the fabrication of such a prosthesis. This prosthesis was used during the treatment planning and surgical phases of treatment for a prosthetic auricular reconstruction. The diagnostic prosthesis and first computed tomography (CT) scan in Step 2 of the Technique section is not necessary for the construction of the craniofacial implant surgical guide. It provided valuable information in this situation, assuring that the patient had sufficient bone present directly under the proposed reconstruction area. This information was important to aid the patient when deciding to remove the surgically reconstructed ear.

TECHNIQUE

1. Make an irreversible hydrocolloid impression (Jeltrate Plus; Dentsply Caulk, Milford, Del) of the maxillary arch, and pour the cast in dental stone (Die Keen; Bayer, South Bend, Ind). Make a moultage of the surgical defect and the opposite ear using a vinyl polysiloxane impression material (Reprosil; Dentsply Caulk) and photograph (Fig. 1).
2. Fabricate a silicone (A-2002 Platinum Silicone Elastomer; Factor 2, Lakeside, Ariz) diagnostic prosthesis on the defect side using the diagnostic cast (Fig. 2). Line the external surface of the prosthesis with lead foil (Biodex Medical Systems, Shirley, NY) so that the bony anatomy of the implant site can be evaluated in comparison to the planned contours of the definitive prosthesis during the CT scan. Verify the presence of bone with adequate thickness prior to removal of the reconstructed ear. (Fig. 3)

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Fig. 1. Surgically reconstructed auricle.

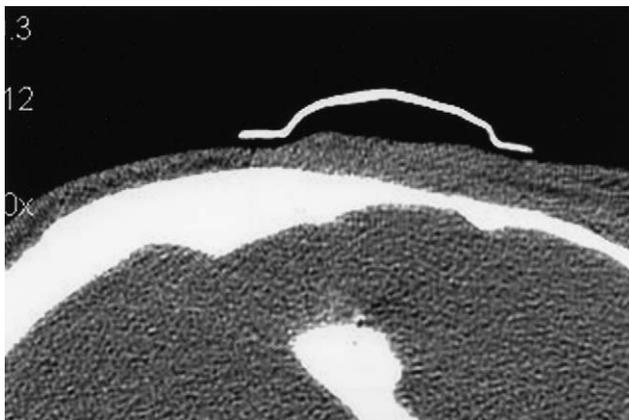


Fig. 3. CT scan demonstrates projected contours in relation to bony anatomy.

3. After surgical removal of the ear and healing of the site, make a moulage of the defect and sculpt an auricular wax pattern with baseplate wax (Neowax; Dentsply Trubyte, York, Pa) to the final contours



Fig. 2. Diagnostic prosthesis.



Fig. 4. Connection of extraoral acrylic resin bar to maxillary splint.

acceptable to the patient. Flask the wax pattern, boil out, and process in clear acrylic resin (Lucitone Clear; Dentsply Trubyte) using conventional techniques. Drill holes (2 mm twist drill; Nobel Biocare, Yorba Linda, Calif) into the acrylic resin ear to indicate the ideal implant placement.

4. Fabricate a maxillary acrylic resin splint (Lucitone Clear, Dentsply Trubyte) using the maxillary diagnostic cast. Provide sufficient retention by engaging undercuts on the maxillary teeth. Extend the splint to provide complete occlusal coverage over the incisal edges and extend 6 mm onto the palatal tissues. Make an acrylic resin projection (40 mm

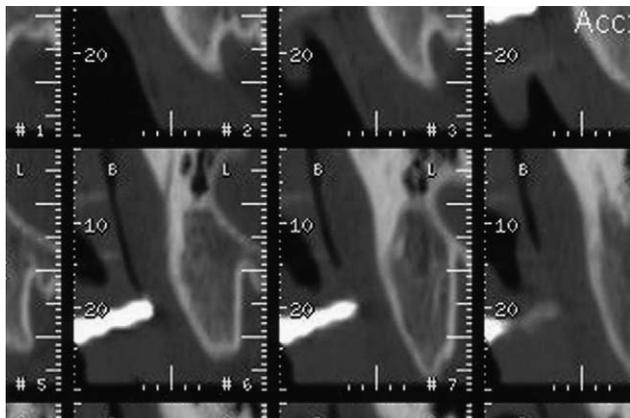


Fig. 5. CT scan demonstrates projected implant location and bony anatomy.



Fig. 6. Guide in place at time of surgery.



Fig. 7. Marking proposed implant location with dye through hole in acrylic ear.



Fig. 8. Completed surgical guide.

wide, 40 mm long, and 25 mm thick) at the maxillary central and lateral incisor area.

5. Fabricate an extraoral acrylic resin bar, 30 mm in diameter, to follow the contour of the face from the lips to the desired location of the reconstructed ear. Use boxing wax (Boxing wax; Dentsply Trubyte) to serve as a mold for the acrylic resin bar. Fill the mold with a clear autopolymerizing acrylic resin (Orthodontic acrylic; Great Lakes Orthodontics, Tonawanda, NY). Discard the boxing wax and trim the excess flash after the resin has polymerized.
6. Connect the acrylic resin bar, ear, and splint (Fig. 4) to assemble the guide. Evaluate the maxillary occlusal splint intraorally and confirm stability. Place the acrylic resin ear at the proper position and have an assistant maintain it in position. Use autopolymerizing acrylic resin (Pattern Resin; GC America, Chicago, Ill) to connect the maxillary occlusal splint, extraoral bar, and acrylic resin ear

(Fig. 4). Verify the orientation of the ear with the guide in place.

7. Place gutta percha (Dental Stopping; Coltene/Whaledent, Mahwah, NJ) into the holes of the acrylic resin ear.
8. Verify bone volume at the planned implant site with a CT scan (Fig. 5).
9. Remove gutta percha and sterilize the surgical guide with ethylene oxide.
10. Place the surgical guide over the maxillary teeth at surgery to indicate the position of the implants (Fig. 6).
11. Mark the proposed location for the implant with a dye through hole in acrylic ear (Fig. 7).
12. Save the surgical guide (Fig. 8) to aid in location of implants at stage 2 surgery.

SUMMARY

The fabrication of a radiographic and surgical guide for craniofacial implant placement is presented. The

use of the maxillary arch as a fixed reference allows for proper placement and repositioning of the device. The guide is used to assist in the radiographic evaluation of the patient by placing gutta percha over the planned implant placement locations. The gutta percha is removed prior to surgery, and the guide holes within the acrylic ear direct the surgeon during implant placement.

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Noteworthy Abstracts of the Current Literature

Long-term treatment outcomes in edentulous patients with implant-fixed prostheses: The Toronto Study

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Purpose. The aim of this prospective study was to report long-term treatment outcomes (prosthetic and implant related) of edentulous patients treated with implant-supported fixed prostheses who participated in the first clinical implant study in North America.

Materials and Methods. Forty-five patients were treated with Brånemark implants supporting a total of 47 fixed prostheses (42 mandibular and 5 maxillary) between 1979 and 1984. All patients were recalled regularly for comprehensive prospective clinical and radiographic assessments.

Results. Thirty-one patients (33 prostheses) attended a final recall visit in 2002; 71% of patients had been followed for 20 years (range 18 to 23 years), with overall prosthetic plan and implant outcome success rates of 84% and 87%, respectively. Mean marginal bone loss around the implants after the first year of loading was small (0.05 mm/year), with high individual variations. Poor oral hygiene, smoking history, and implant position appeared to be predictors of marginal bone loss. Prosthetic maintenance was ongoing and included fractured components and replacement of prostheses; the longevity of a fixed prosthesis for this group of patients was 8.39 ± 5.30 years.

Conclusion. This study confirmed the overall long-term treatment outcome success of patients treated with fixed prostheses supported by Brånemark implants. Successful osseointegration with small mean bone loss was maintained as study patients aged, although prosthetic maintenance was required. The latter consideration should be discussed with all patients seeking such treatment.—*Reprinted with permission of Quintessence Publishing.*