

Craniofacial Implant-Retained Auricular Prosthesis: A Case Report

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Implants provide patients with a safe and reliable method for anchoring auricular prostheses that enable restoration of their normal appearance and offer improved quality of life. In this case report, an auricular prosthesis was fabricated for a patient who had lost his right external ear in a traffic accident. Extraoral implants and bar-and-clip retention for the proper connection of the auricular prosthesis to the implant were used.

Key Words: *maxillofacial prosthesis, auricular prosthesis, implant-retained prosthesis, auricular deformities*

INTRODUCTION

Congenital or acquired absence of facial structures caused by malformation, cancer treatment surgery, or trauma leads to functional deficits and enormous psychological strain, and therefore requires rehabilitation.^{1,2} The loss of an auricle, in the presence of an auditory canal, affects hearing, because the auricle gathers sound and directs it into the canal. With natural ears, the auricle acts as a resonator to slightly amplify lower-frequency sounds. The auricle also helps to localize sounds, especially in conjunction with the other ear.³

Auricular prostheses were conventionally retained using adhesives, natural undercuts at retention sites, or spectacles. However, these methods were unsatisfactory because of frequent loss of retention, skin reactions to adhesives, or unnatural movements of the prosthesis. Osseointegrated implants became a popular method of prosthesis retention, initially using a bar-and-clip and magnet and other retention device.⁴⁻⁸

A successful rehabilitation with facial prosthesis depends on knowledge concerning principles of facial harmony, colors mixture, adaptation, retention, prosthesis weight, durability, and biocompatibility. Such characteristics are directly related to material selection.^{5,9,10} The most common materials for facial prostheses are heat-polymerized acrylic resins and heat-polymerized and autopolymerizing silicone.^{5,11} Patients with auricular prosthesis may have some problems, especially during bathing, sleeping, or other activities. However, it may be difficult to protect these epistheses from external factors such as rain, sun, and cold weather.^{12,13} Therefore, in some cases the outer constructions of the prosthesis have been produced in a removable manner, and a system, for example, a bar or magnet, has been used to attach this removable part to the implants.¹²⁻¹⁵

This case report describes the clinical and laboratory procedures for fabricating an implant-retained auricular prosthesis for a boy with a right ear defect resulting from a traffic accident.

CLINICAL REPORT

A 15-year-old boy who had lost his right external ear (Figure 1) in a traffic accident was referred by his plastic surgeon to the Prosthodontic Clinic at the University of Selçuk. The patient received the implants in accordance with a 2-stage surgical

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FIGURES 1–4. **FIGURE 1.** Right auricular ear defect caused by a traffic accident. **FIGURE 2.** Impression of the defect. **FIGURE 3.** Retention elements on die stone and wax pattern. **FIGURE 4.** Completed wax pattern.

procedure. Three 4-mm extraoral implants (EO implant, Institut Straumann, AG, Basel, Switzerland) were placed for each temporal bone by plastic surgeon. After soft tissue healing and osseointegration were confirmed, 5.5-mm abutments were inserted. Hair adjacent to the ear was coated with petroleum jelly (Vaseline, Chesebrough-Pond's USA Co, Greenwich, Conn), and cotton was placed in the ear canal. After the 3 gold caps (Institut Straumann) were connected to abutment replicas on the cast, impressions of the abutments and defect area were made using polyvinyl siloxane impression material (Virtual, Ivoclar Vivadent, Schaan, Liechtenstein)

(Figure 2). The impression was boxed and poured in die stone (Glastone 3000 Die Stone, Dentsply International, York, Pa).

A prefabricated Dolder bar (048.411, Institut Straumann AG) was used to splint the implants and provide retention by means of clips (048.413, Institut Straumann) in bar-clip-retained prostheses. Gold bars were cut to size, and sections were positioned appropriately using small amounts of silicone putty. The sections of gold bar were fixed to the gold cap using cyanoacrylate adhesive (Zapit, Dental Ventures, Corona, Calif). The bar was prepared in soldering investment (Deguvest L,



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FIGURES 5 AND 6. FIGURE 5. Completed mold with space created by the wax pattern. FIGURE 6. Finished implant-retained auricular prosthesis positioned in place.

Degussa, Hanau, Germany) (Figure 3). After soldering, the assembly was freed from the investment. Depending on the bar design, metal clips were used to retain bar-clip-retained prostheses. Acrylic resin (Panacryl, Arma Dental, Istanbul, Turkey) was placed to fabricate the substructure that housed the clips (Figure 3). A wax (Set-Up Wax, Dentsply Trubyte, York, Pa) pattern of the prosthesis was created using the donor technique, in which a person with ear contours that closely mimic those of the patient acts as the donor to make an ear impression that is then completed on the definitive cast. The size, shape, position, and fit of the wax pattern were evaluated on the patient. Then the wax pattern was included in a metal muffle and heated (Figures 4 and 5).

After the complete removal of wax, the silicone elastomer, which was colored intrinsically (Factor II Intrinsic Coloring Kit, Lakeside, Az), was then bulk filled, and the material was processed for 1 hour at 100°C in autoclave according to the manufacturer's directions. The final corrections were made, and the silicone prostheses were colored extrinsically (Factor II Extrinsic Coloring Kit, Lakeside, Az) then adapted to the defect area (Figure 6).

DISCUSSION

Bone-anchored titanium implants may provide patients with a safe and reliable method for anchoring auricular prostheses that enable restoration of their normal appearance and offer improved quality of life. Hence, the use of bone-anchored prostheses should be considered a viable alternative to surgical reconstruction.

Once implants are successfully placed, 3 basic retentive systems can be used: the bar and clip, the ball and keeper, and the magnet and keeper. The bars and clips, as used in this study, can be used for each patient to ensure mechanical advantage. Disadvantages are the cost and the increased difficulty for the patient in performing the necessary implant-associated hygiene.⁶

Although some researchers have recommended that 2 implants are enough for function, because the episthesis is not heavy,¹³ others have preferred 3 or 4 implants when the computerized tomography sections were examined and the temporal bone quality seemed to be appropriate for osteointegration.¹⁴ In this case report 3 implants were used because of the temporal bone quality.

An inadequate bond between silicone elastomer and acrylic resin remains a problem and may result in prosthetic failure, especially in bar-retained prostheses.³ Acrylic resin primer must be coated with acrylic to solve problems concerning loss of bond between the silicone and acrylic resin substructure. The extrinsic and intrinsic coloration of maxillofacial silicone elastomers has always been a challenge for clinicians in obtaining a perfect marginal adaptation with the surrounding skin tissues.

REFERENCES

1. Dib LL, de Oliveira JA, Neves RI, Sandoval RL, Nannmark U. Auricular rehabilitation by means of bone grafting from the iliac crest in combination with porous extraoral implants: a case report. *Clin Implant Dent Relat Res*. 2007; 9:228–932.
2. Gumieiro EH, Dib LL, Jahn RS, et al. Bone-anchored titanium implants for auricular rehabilitation: case report and review of literature. *Sao Paulo Med J*. 2009;127:160–165.
3. Karakoca S, Aydin C, Yilmaz H, Bal BT. Retrospective study of treatment outcomes with implant-retained extraoral prostheses: survival rates and prosthetic complications. *J Prosthet Dent*. 2003; 103:118–126.
4. Alvi R, McPhail J, Hancock K. Closed-field titanium magnets for the retention of complex craniofacial prostheses. *Br J Plast Surg*. 2002;55:668–670.
5. dos Santos DM, Goiato MC, Pesqueira AA, et al. Prosthesis auricular with osseointegrated implants and quality of life. *J Craniofac Surg*. 2010;21:94–96.
6. Del Valle V, Faulkner G, Wolfaardt J, Rangert B, Tan HK. Mechanical evaluation of craniofacial osseointegration retention systems. *Int J Oral Maxillofac Implants*. 1995;10:491–498.
7. Gary JJ, Donovan M. Retention designs for bone-anchored facial prostheses. *J Prosthet Dent*. 1993;70:329–332.
8. Lemon JC, Chambers MS. Locking retentive attachment for an implant-retained auricular prosthesis. *J Prosthet Dent*. 2002;87: 336–338.
9. Goiato MC, dos Santos DM, Gennari-Filho H, Zavanelli AC, Dekon SF, Mancuso DN. Influence of investment, disinfection, and storage on the microhardness of ocular resins. *J Prosthodont*. 2009; 18:32–35.
10. Goiato MC, Fernandes AU, dos Santos DM, Barao VA. Positioning magnets on a multiple/sectional maxillofacial prosthesis. *J Contemp Dent Pract*. 2007;8:101–107.
11. Polyzois GL. Color stability of facial silicone prosthetic polymers after outdoor weathering. *J Prosthet Dent*. 1999;82:447–450.
12. Sencimen M, Bal HE, Demirogullari M, Kocaoglu M, Dogan N. Auricular episthesis retained by an attachment system (2 case reports). *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2008; 105:e28–e34.
13. Wazen JJ, Wright R, Hatfield RB, Asher ES. Auricular rehabilitation with bone anchored titanium implants. *Laryngoscope*. 1999;109:523–527.
14. Nishimura RD, Roumanas E, Sugai T, Moy PK. Auricular prostheses and osseointegrated implants: UCLA experience. *J Prosthet Dent*. 1995;73:553–558.
15. Tjellstrom A, Yontchev E, Lindstrom J, Branemark PI. Five years' experience with bone-anchored auricular prostheses. *Otolaryngol Head Neck Surg*. 1985; 93:366–372.