Silicone auricular prosthetics with adhesive retention: a case report

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ABSTRACT
A-18-years-old male came to the Dental and Oral Hospital of Hasanuddin University with a complaint of losing his left ear due to a traffic accident several years ago and often feeling pain in his ear especially when blown by strong winds. The patient wants to make an auricular prosthesis so that his self-esteem returns to normal. The extraoral examination showed convex profile, oval-shaped face, symmetrical eyes, nose and lips, submandibular lymph nodes exhibit without complaints. The right and left ears are not symmetrical. Manufacture of silicone auricular prosthesis with adhesive retention. Anatomical impressions of the patient's and his siblings' ears were performed as a guide for duplication of the patient's left ear using an irreversible hydrocolloid impression material. The wax pattern of the ear prosthesis that had been made on the die was paired with the patient to check the size accuracy and left and right symmetry. Then proceed with the process of acrylic packing and coloring. After the laboratory process was completed, insertion is carried out. Signs of successful treatment: silicone ear prosthesis with adhesive retention has restored the patient appearance and self-esteem.

Keywords: auricular prosthesis, silicone, adhesive, self-esteem
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INTRODUCTION

Ear defects can occur secondarily to congenital malformations, trauma or tumour surgery. The absence of an ear is a considerable aesthetic problem that may affect the patient's psychology and social behaviour.[1] Correction of ear defects can be accomplished surgically, prosthetically or through a combination of these approaches; the choice of treatment depends on the site, size, age and aetiology of the defect as well as the patient's desires.[1,2]

Reconstructive surgery is limited by the age and medical conditions of the patient, insufficient residual tissue, vascular compromise due to radiation and the patient's preferences.[3,4] Further, after a surgical procedure, the reconstructed ear may not resemble the normal one.[5] On the other side, prosthetic treatment can produce an anatomically accurate and aesthetic device.[4,6] Before introduction of osseointegration, auricular prostheses were retained by adhesives or a connection to eyeglasses.[4,6,7]

The aim of maxillofacial rehabilitation should provide a suitable prosthesis for patients with facial defects so that they are rehabilitated back to the society to face and accept the challenges of life.[8,9] It encourages the best possible quality of life and upholds their self-image during their traumatic psychological adjustment.[10] Among the large number of materials that have been tried out in the history of anaplastology, for example, porcelain, natural rubber, gelatin and latex, two have established them-selves: methacrylates and silicones.[10-12] Retention and stability are major concerns regarding comfortable use of a facial prosthesis. Medical adhesives, anatomical undercuts and mechanical devices like spectacles, hair bands, magnets and implants have been used to retain prosthesis. Since the introduction of percutaneous endosseous implants for use with bone conduction hearing aids in 1977, implants have acquired important role in the prosthetic rehabilitation of patients with craniofacial defects.[13] Implants can vastly improve the retention and stability of a facial prosthesis. Despite improvement in per capita income, financial consideration is among one of the prime barriers in seeking maxillofacial treatment in developing countries.

This article describes a simplified and economical approach for fabricating silicone auricular prosthesis.

CASE

A-18-years-old male, came to the Dental and Oral Hospital of Hasanuddin University with a complaint of losing his left ear due to a traffic accident and often feeling pain in his ear especially when blown by strong winds. The patient wants to make an auricular prosthesis so that his self-esteem returns to normal. Extraoral examination, convex profile, oval-shaped face, symmetrical eyes, nose and lips on the right and left, submandibular lymph nodes exhibit without complaints. The right and left ears are not symmetrical.

Examination of the ear area is carried out to confirm the diagnosis of the patient's defect. Based on the classification according to Luo et al, the patient's ear defects are categorized as type III dis-

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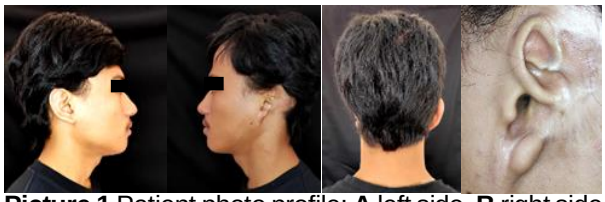
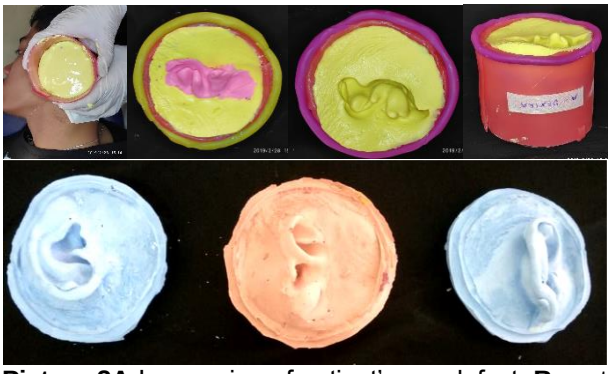


Picture 1 Patient photo profile; **A** left side, **B** right side, **C** back view, **D** defect photo of patient's left ear



Picture 2A Impression of patient's ear defect, **B** cast model of the ear

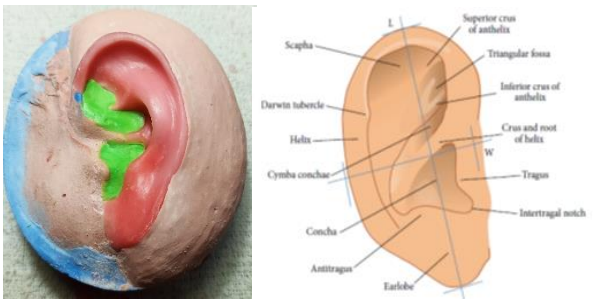
orders, namely most part or total ear loss with periauricular skin intact (Fig.1).

MANAGEMENT

Impression of the patient's auricular defect area was carried out with the patient in the dental unit in the supine position, the head position was adjusted so that the defect area was visible in the horizontal plane, and the patient was given a protective apron to protect his clothes during the impression procedure. The area around the auricular is outlined with a pencil that is not easily erased. The coordinates of the vertical and horizontal axes of the ear are made on the patient's skin. This mark will be transferred to the printout and will be visible on the working model. The image coordinates must be properly oriented during the fabrication of the new auricular prosthesis. Boxing is made using red wax to facilitate the impression process (Fig.2A).

The waxing up process is carried out by carving the shape of the on the working model with wax along the largest helical and lobe dimensions that cover all parts according to the anatomical shape of the ear. The posterior corner that has been completely carved is boxed by pouring the stone into the box area on the lower surface of the posterior helix and lobe. Boxing wax is removed from the superior aspect of the posterior which has been finished forming for easy carving on the external and exterior ear surface (Fig.2B).

The try-in stage for the patient is carried out after the waxing-up process is completed (Fig.3). The following points are checked at try in; the fit of prosthesis on the tissue, the correct horizontal alignment with the natural ear, the projection of the ear in relation to the side of the head, and the integrity of the margins.[15] After this stage is followed by the packing and coloring process.



Picture 3A Wax modelling results, **B** anatomy and landmarks of the auricle (Source: Storck K, Staudenmaier R, Buchberger M, Strenger T, Kreutzer K, von Bomhard A, Stark T. Total reconstruction of the auricle: our experiences on indications and recent techniques. BioMed Res Int 2014; Article ID 373286, 15 pages http://dx.doi.org/10.1155/2014/373286).

Picture 4 Try in process of auricular prosthesis waxing up; **A** front side, **B** back view, **C** side view.

The wax prosthesis is now sealed to the model and the leading edge is thinned as much as possisible so as to allow the silicone edges to feather into the natural skin. A three part mould is necessary to achieve easy placement of silicone. Embed the mould in plaster up to the leading edge. The middle section of the flask is added and stone is filled into the entire undercut section of the mould along the part line. After a suitable separating medium is applied, the remainder of the flask is filled with stone and is closed. Also, the plaster can be soaked in soap solution which acts as a separator. The helix undercut is poured in a hard dental stone. When pouring the section, finish the plaster so that the flash line will be on the undercut side of the helix. Allow to set, and then cut grooves to allow location with the top half of the mould. Mould is again soaked in soap solution (Fig.4).

The next step is to stain the auricular prosthesis by matching the skin color of the patient's ear (Fig.6). The staining technique chosen is the intrinsic staining technique by matching the color of the skin with the color of the silicone to be used.

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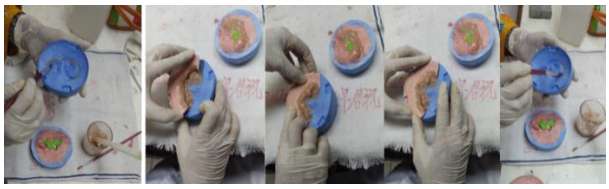

Picture 5. Packing process of auricular prosthesis

Figure 6 Shade matching technique of patient's ear. Source: Krishna PD, Archana AS, Anupama PD. Fabrication of a silicone auricular prosthesis – a case report. NUJHS 2016: 6(1), ISSN 2249-7110

Figure 7A Colored auricular prosthesis, B ready to insert

Figure 8A Adhesive material using to attach the auricular prosthesis, **B** after auricular prosthesis inserted

After the colouring phase is complete, the auricular prosthesis is attached to the patient's defect area using adhesive material.

DISCUSSION

The replacement of anatomical parts is an art and science. Prosthesis form, coloration, texture must be as indiscernible as possible from the surrounding natural tissue. The ideally constructed prosthesis must duplicate the missing facial features so precisely that the casual observer notices nothing that would draw attention to the prosthetic reconstruction. The primary objective of maxillofacial prosthetics is to restore esthetics, function and preserve the remaining hard and soft tissues. The accomplishment of primary objective often leads to the important secondary objective of restoring the individual to the society and enabling them to lead a normal life.

In the initial evaluation of a patient for auricular reconstruction, several variables must be considered. These variables include a) patient-related factors, including medical health, medications, and smoking; b) patient's reconstructive goals cause of the defect; c) type of tissue involved: partial thickness versus full thickness; d) size and location of the defect; e) condition of surrounding local and regional tissues.

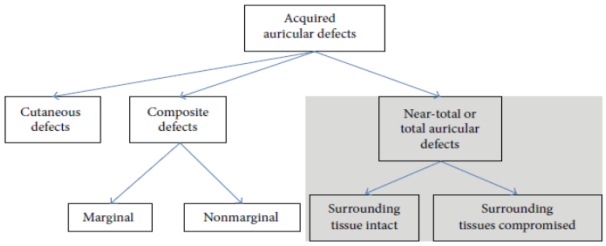

Figure 9 Louis' classification of acquired defects of ear.[14]

There are several advantages to silicone maxillofacial prosthesis. It requires little or no surgery, the patient spends less time away from home and job and the reconstruction is often more natural-looking. However, the drawbacks include the necessity of fastening the appliance to the skin and removing it every day. The function of the prosthetic ear is to direct the sound waves into the auditory canal and to maintain a proper environment for the inner ear membranes. It normally improves hearing by about 20%. The prosthetic ear will retain eyeglasses, and retain a hearing aid if needed. It also serves as a great psychological benefit in the rehabilitation of the patient.

The entire treatment was divided into four appointments: a) impressions, b) fabricating wax pattern, c) making the mould, and d) processing the prosthesis.

The difficulties faced during fabrication of custom-made prosthesis are; obtaining accurate impression of the defect without any compression or distortion of tissue, orientation of ear in harmony with the contra lateral ear, sculpturing the exact anatomy and position of the prosthesis, obtaining a satisfactory shade exactly matching to the skin complexion of contra lateral side of the face.

The location of the prosthetic auricle is predetermined by first observing the topographic relationship of opposite normal ear with facial features in cases of unilateral prosthetic reconstruction and then duplicating its position at the proposed reconstruction site. According to Tolleth, three measure-

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ments must be correct to achieve a proper placement of the auricle; *axis, level* and *distance* from the orbit.[16]

Axis; it is difficult to define exactly the positioning of the axis, but it can be described as the *line of balance* through the long dimension of the ear. Some indicate that axis is parallel to the bridge of nose. An angulation of 20° from vertical position seems to be satisfactory.

Level; the level can be assessed with the head in the anatomic vertical position. The highest part of the helix is on a line roughly with that of the eyebrow, and the lowest part of the lobule is on a line at the base of columella or slightly below that.

Distance from the orbit; the ideal distance of the prosthesis from the lateral orbital rim is about one ear length, or 6.5-7.5 cm.

The retention and stability of the prosthesis is an important factor for the prosthesis; hence the ear prosthesis can be retained by various methods of retention, either by using anatomical undercuts, hair bands, and frame of eyeglasses, adhesives and implants with magnets or bars.[17]

Although implants can provide better retention and stability of the prosthesis, the reported drawback of implants was high number of failure rates due to the effect of radiation therapy on bone morphology, the compromised healing of the skin in the region of the mastoid and accuracy of impression over movable tissues.[18] In addition, cost factor of the implants and the waiting period was not acceptable by the patient.

Another major disadvantage was that due to psychological trauma of undergoing oncosurgery, the patient hardly agrees to undergo another surgery for Implant placement. Thus, due to these factors, clinicians had no better option rather than using custom made prosthesis for such patients.[19]

The skin adhesive may degrade and results in reduced strength and bonding property over a long period of time; some skin adhesives have been reported to cause hypersensitive reactions.[19] Although the success rate of implant supported prosthesis is very high, the prosthesis retained with skin adhesives, anatomical and soft tissue undercuts are more successful due to their ease of application and are comparatively less expensive then implant supported prosthesis.[20]

Silicone elastomeric materials are more commonly used, because they provide better stability and good marginal adaptation, which satisfies patient's cosmetic and esthetic needs; but the major disadvantage is that the manipulation of silicone requires more complex, advanced and multifaceted techniques which are rather more expensive.[21] The silicone elastomeric material possess' excellent physical properties with good heat stability and are chemically inert materials, particularly when they are used in fabrication of prosthesis used to restore body parts.

Silicon elastomeric material possesses soft tissue like consistency; provide additional advantage when they are used to restore the defects in movable soft tissues. Silicon materials are available in various shades provided by manufacturers to give exact shade and texture of skin which closely simulate and resemble shade of patient's skin complexion. The drawback of the silicon prosthesis is that, in the long term the prosthesis material degrades easily and its additives undergo changes when exposed to moisture, high temperature, UV light and sunlight, thus creating a need for replacement by a new prosthesis. To overcome these disadvantages newer polymeric materials have been introduced like polyphopozenes, silicon block polymers, methacryloxy propyl terminated polydimethylsiloxane with enhanced mechanical, chemimical and physical properties, such as increased elongation, high edge strength, improved heat stability, good tear strength, chemically inert, low hardness and viscosity for fabrication of maxillofacial prostheses.[19]

The use of craniofacial implants for retention of extraoral prostheses, such as ears, offers excellent support and retentive abilities[1-3] and improves a patient's appearance and quality of life. The use of implants can eliminate or minimize the need for adhesive and allows for proper orientation and seating of an ear prosthesis by the patient. However, a satisfactory outcome may only be achieved by careful planning in terms of the number and position and orientation of the implants and the proper connection of the ear prosthesis to implant retention structure with a cast or machined bar. Precious alloys are commonly used for construction of a bar because of their excellent strength, but casting precious alloys onto wrought metals may not result in a perfect union.[4] The dental laboratory procedures involved are complex and expensive.[6]

Although our patient's silicone prosthesis could be worn without adhesives by snapping it onto his eyeglass earpiece, many patients require adhesives (eg, *Hollister, Mastisol*) or specially formulated facial prosthetic adhesives (*Daro, Pros-Aide, Secure*). Adhesives require patience and precision of the wearer to obtain correct initial placement of the prosthesis. This may be very difficult for older

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patients who have limited vision and dexterity in addition to the challenge of focusing on one side of the head while looking in the mirror. Silicone-based adhesives require solvents for cleaning the prosthesis, which accelerate deterioration of the prosthetic margins. Allergic contact dermatitis is known to occur with skin adhesives. Some prostheses may be lined with urethane to improve adhesion.[22]

It was concluded that auricular prosthesis is an option to restore the aesthetic function of the patient's face, thereby increasing the patient's self-confidence. Silicone material bonded with adhesive material is the best choice for patients who cannot be implanted as a retention of their auricular prosthesis.

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