Case Report

Prosthetic Reconstruction for a Child with a Congenital Bilateral Ear Deformity: Case Report

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Objectives: Microtia is the most commonly seen congenital ear defect, and involves an auricular deformity either unilaterally or bilaterally. The aim of this study was to fabricate silicone prostheses for a child with bilateral microtia using an innovative technique.

Methods: This method involved the construction of bilateral ear prostheses using clips, which were located within the layers of the silicone superstructure.

Results: Surgical reconstruction was not indicated due to the patient's age; so prosthetic reconstruction was advised in this case.

Discussion: Two prosthetic ears were manufactured, with one being attached using an adhesive method and the other by a self suspension method. The child and his parents were very satisfied by the cosmetic and aesthetic appearance of the prostheses fitted. This technique has been proven to be suitable for pediatric patients with microtia

Keywords: Microtia, Prosthetic reconstruction, Ear prosthesis

Submitted: 20 June 2015
Accepted: 22 August 2015

Introduction

Ear defects may be congenital, or occur as a result trauma or development of a tumor (1). Microtia is the most commonly-seen congenital auricular deformity, with a prevalence of 1 in 8000-10000 births, and can occur either unilaterally or bilaterally (2). The right ear is usually involved in unilateral cases. The typical external appearance of microtia is comma-shaped with a small area of cartilage situated in its superior aspect. Prosthetic reconstruction and surgical correction are the two methods currently used for modification of such ear defects (3). Surgical treatment of the ear has historically been a major challenge due to the complex shape and size of the human ear (4). Conversely, prosthetic rehabilitation has provided better morphological results, using a pattern produced via the use of a donor ear (5).

Prosthetic replacement for missing facial tissue has several advantages when compared to surgical reconstruction. It is relatively inexpensive, and both the prosthesis attachment site and the prosthesis itself can be cleaned easily. There is also complete control over the color, shape and position of the prosthesis. However, prosthetic replacement can cause localized irritation on the attachment site, depending on the nature of the material that is used, and on the use of adhesives and other methods employed for prosthesis suspension (6). To offset the need for adhesives, prosthesis suspension may be achieved by utilizing the residuum, employing a technique previously introduced by the author. This method may obviate the need to use adhesives and implants in such defects (7). Fabrication of prosthesis may be more appropriate than surgical procedures in many cases because of psychological, social and economical considerations. Moreover, an

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acceptable cosmetic appearance may increase the patient's self-confidence. Therefore, this study describes the manufacturing technique utilized in producing bilateral silicone prostheses for a child with a congenital bilateral ear deformity. The aim was to achieve an aesthetically acceptable result, which would suspend effectively, and would be easy to don and doff.

Case report

The patient was a 6 year old male child with bilateral microtia. He was referred to the prosthetic department within the dental school, Shahid Beheshti University of Medical Sciences, for assessment and suitable treatment. As it was not possible to perform surgical reconstruction and rehabilitation with implants, he was referred to the Orthotics and Prosthetics Department of the University of Social Welfare and Rehabilitation Science for prosthetic replacement. The child was initially very shy and was not able to communicate effectively; so a psychologist and translator were enlisted to ensure appropriate treatment was offered. Approval of the Ethics Committee of University of Social Welfare and Rehabilitation Science was obtained, and informed consent was given by his parents for treatment.

Technique

One of the most common problems in maxillofacial patients is the emotional problems suffered by both themselves and their family. Therefore, initial treatment sessions were undertaken with the participation of a pediatric psychologist, a suitable interpreter, and with the child's immediate family in attendance, which was essential in ensuring that the treatment progressed satisfactorily.

Patient Assessment

The initial patient assessment showed that the left ear attachment site had a stable residuum that could be utilized to self-suspend a suitable prosthesis (figure 1c). However, the residuum of the right ear was too soft, loose and incorrectly positioned. Consequently, after consultation with the child's family, it was decided that the right residuum would be removed prior to the prosthesis construction process (figure 1a and figure 1b). After a short recovery period, the child was ready for the fabrication process.

(a) (b) (c)

Fig 1. right residuum prior to removal (a); after removal (b); and left residuum (c)

The impression taking method

The areas where the patient's residual ears were to be sited (where impressions needed to be taken) were covered with alginate. In this case, no ear hole was evident on either side (if an ear hole is present, it should normally be covered with cotton impregnated with Vaseline to form a temporary block prior to the application of the alginate). However, a residual tissue formation was evident on the left side, which could subsequently be used to suspend the finished prosthesis. A pre-formed cardboard pattern was used to enclose the area around the ear and was then filled with alginate (Tropicalgin; Zhermack, Italy). Once set, the alginate was removed and filled with dental plaster. These two (right and left) plaster bases thus formed the molds that would be used to provide the templates for the silicon bases that would be attached directly to the patient (see figure 2).

Fig 2. Right and left plaster bases, replicating the patient's prosthesis attachment sites

Similarly, impressions were formed from the donor ears made using the same alginate (figure 2) and were subsequently filled with wax.

Fig 3. Alginate being used to create negative impression of donor ear

Sculpting technique

The negative alginate impressions from the donor ears were then poured with melted wax (Covex Company, modeling wax, Netherlands) (see figure 3). Once set, the wax was removed from the alginate impressions, and placed directly onto a virtually unmodified plaster base for the right ear, with thin wax edges blending in to the base to provide maximum aesthetic appearance and functional application. For the left ear, approximately 20 percent of the plaster base was modified, in order that the finished silicone ear would have effective self-suspension, without the need for adhesive. Then, the wax shell was put on the left ear until it was completely covered with wax to produce two very similar wax moulds.

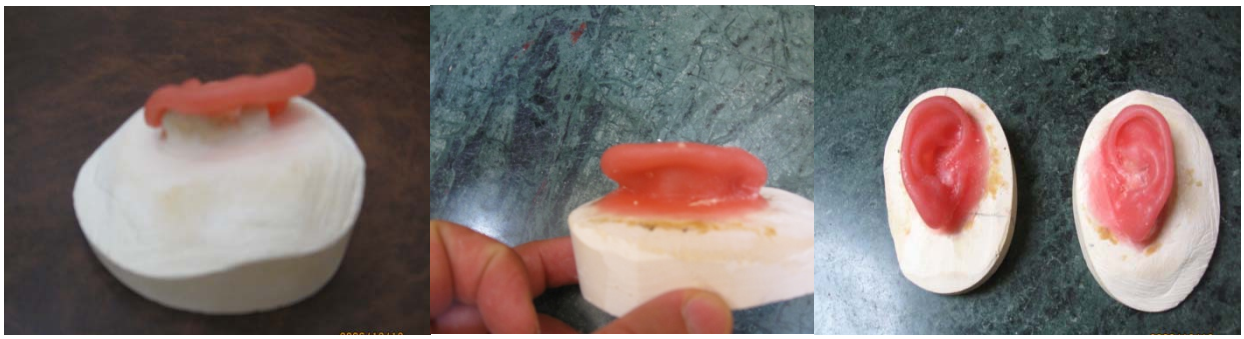

Fig 4. Plaster bases with wax models attached

Investment technique

To create a usable mold that could be poured, an additional wax piece was formed around the posterior aspect of the original wax ear, in a distinct colour that distinguished it from the wax ear. This new built up structure was then poured with plaster as before, and then the colored wax piece was removed intact, before being replicated in plaster (see fig 5). This effectively left a three piece plaster mold, once the original ear wax was melted out, leaving a negative impression within the mold of the ear structure plus the attachment that would be needed to affix the ear to the affected site.

Fig 5. Construction sequence of three piece mold

Color matching and silicone pour

The Prosthesis colors were made from oil paints and derma color, within a mixture that was matched as closely as possible to the tones of the patient's skin (RTV 3040; Shimi Afsoon Company, Iran). The components of paints were mixed together. Before injecting the paint, the plaster mold was coated with silicone spray to assist in prosthesis removal.

The silicones were mixed with the hardener and then poured into the mold, which was then closed tightly. After 24 hours, the mold was opened and the ear prosthesis was carefully removed.

Fig 6. Colour matching and silicone pour

Fitting the prosthesis

Initially, the edges of the prosthesis were trimmed using a milling machine, in order that close, smooth fitting could be achieved next to the skin and the left ear residuum. Then, secondary colours were added to the prosthesis, in the presence of the patient, with light and dark shadows; to create the most natural appearance. After fitting the left ear prosthesis and ensuring effective suspension was achieved, the right ear was attached by adhesive, and the patient saw himself in the mirror with his new ears.

Fig 6. The final prostheses; as manufactured (left) and fitted to the patient (right).

Discussion

Ear defects, including partial or complete malformations, may be the result of various causes such as congenital defects, tumors, inflammation of the cartilage, and trauma (3,8-10). Treatment options include surgical reconstruction or prosthetic rehabilitation (3,8). Prosthetic ear reconstruction using the donor ear for matching with the contra-lateral ear sometimes provides better morphology (11). Ear reconstruction surgery is complex by nature, and is one of the great challenges for surgeons (4). Therefore, providing prosthetic alternatives is an effective solution for recreating an aesthetic appearance for the affected individual. In addition to recreating the shape and symmetry of the ear, the prosthesis should provide good color matching, appropriate suspension and stability, appropriate alignment, correct positioning, skin-compatibility and durability (11,12).

Suitable suspension for the prosthesis may be obtained by different methods, which will depend on the patient's physical condition, age and the condition and position of any remaining residuum. In this study, the child had a congenitally absent ear on both sides, with a residuum that could be used on the left side, but not the right side. The child's young age made the prospective use of implants and surgical reconstruction virtually impossible. Therefore, the use of adhesive to attach the right prosthesis, and use of the self suspension method (7) in the left ear, was the most suitable option for this patient. The patient found that wearing the left ear was easier, since this had a self suspending prosthesis. The child's family was satisfied with the prostheses' appearance, color, shape and suspension and was happy that this does not now pose a problem for him at school or elsewhere.

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