CASE REPORT

Repositioning an Implant-retained Auricular Prosthesis using a Custom Acrylic Base: A Case Report

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ABSTRACT

Prosthetic rehabilitation offers an alternative to surgical procedures for repositioning implant-retained auricular prosthesis. This report illustrates a prosthetic rehabilitation of a 15-year- old male with a unilateral microtia who presented with an unfavorable implant-retained left auricular prosthesis. The implants placed seven years ago were drifted posterosuperior away from the ideal ear canal position. The fabrication of a new prosthesis on the existing bar-clip attachment using a custom acrylic base was planned to correct the location. A skin-colour perforated custom acrylic base was fabricated and designed to extend anteriorly, therefore, shifting the prosthesis forwards into a more natural location. The custom base was able to relocate the prosthesis' position without compromising its retention whilst engaging the existing implant attachment. This in turn enhanced prosthesis acceptability and improved the patient's confidence. The custom acrylic base serves as a viable option to reposition the prosthesis influenced by age related growth and development.
Malaysian Journal of Medicine and Health Sciences (2023) 19(1):378-381. doi:10.47836/mjmhs19.1.50

Keywords: Auricular prosthesis, Implant-retained, Microtia, Acrylic base, Malposition

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INTRODUCTION

Microtia is an abnormally small, or under develop pinna (external ear), is a clinical phenotype of the first and second branchial arch syndrome. The conundrum of aetiology of this congenital malformation is unresolved but linked to drug or alcohol abuse during pregnancy, environmental factors, and a diet low in carbohydrates and folic acid. It commonly involves the external and middle ear meatus that might affect the hearing as well as aesthetic appearance.

Early reconstruction and rehabilitation of facial deformities is beneficial to the psychological wellness and social behavior of children; especially as they reach school age. Various surgical reconstruction techniques, including microsurgical transfer and autogenous or alloplastic graft, have been introduced for the reconstruction of auricular defects. However, the complication of surgery, morbidity of donor-site and chances of immunologic rejection can be severe especially among pediatric patients. Hence, an auricular prosthesis could be the efficient alternative (1). The use of hard or soft tissue undercuts and medical grade skin adhesives have become traditional means of retaining auricular prosthesis. However, these techniques often cause a lack of retention, stability, adverse skin reactions and early prosthesis deterioration. To overcome this, the use of osseo-integrated implants with bar-clip attachments have been incorporated in auricular prosthesis construction, minimizing some of these disadvantages and providing patients with improved retention and stability (2)

Although the success of implant retained auricular prosthesis treatment is predictable, the placement of osseo-integrated implants in growing patients is challenging and complicated. The lack of soft tissue landmarks and minimal mastoid bone thickness in the deformed auricular area will make the location of the implant placement critical and demanding (3). Moreover, the effect of age-related growth and development may result in migration of the implant superior-posteriorly in the temporal bone, affecting the symmetrical position of the auricular prosthesis as compared to the normal contra-lateral ear (4). The malposition of the auricular implant retained prosthesis was rarely reported as a complication. The need for clip activation, loosening of bar screws and abutments, as well as loss of attachment between silicone and the acrylic resin substructure were all common complications.

Solutions for correcting malposition implant retained auricular prosthesis because of early rehabilitation are rarely available. This clinical report describes the usage of a custom acrylic base as a feasible solution to overcome the malposition prosthesis.

CASE REPORT

A healthy 15 year-old male attended his regular review visit to the Prosthodontic Clinic requested an auricular prosthesis replacement. He presented with a unilateral microtia and had an implant-retained left auricular prosthesis with bar-clip attachment which was fabricated at the age of eight (Fig. 1A).

Upon examination, facial asymmetry was observed with the chin deviated to the left (Fig.1B). He presented with Grade 4 microtia with hearing loss due to absence of external auditory canal. Two implants attached to a twin Hader Bar framework were noted. A Grade II skin reaction with erythematous tissue was also seen around the peri-abutments region. The attachments and implants were located posterosuperior from the ideal external auditory meatus position. Tissue mobility at the defect site was absent during condylar movement.

The existing prosthesis presented with defective margins, non-textured surface, unsuitable shade matching, and ill-fitting. The retention was also fair due to wear of the clips. The prosthesis was misaligned compared to the contra-lateral ear.

To overcome the skin reaction on peri-abutment region, the patient was instructed to clean the area on a daily basis with 0.12% chlorhexidine, assisted by his parents. The implants were placed in another country, so we had no access to his records. As the patient could not recall the history of the implant placements and his preferences for non-surgical intervention, a decision was made to fabricate a new implant-retained auricular prosthesis on the serviceable existing attachment. An informed consent was obtained for the guardian. A custom acrylic base was designed with the aim of correcting the prosthesis position.

An impression on the defect area was made using the tray-less impression, whereby a skin-marking pencil was used to place orientation marks which included the location of the external auditory meatus and the angulation of the long axis of the ear (Fig. 1C). The impression was made using irreversible hydrocolloid impression material (Kromopan , Lascode, USA), which was then mixed with an additional 50% of water to improve its fluidity to facilitate the impression procedure. A layer of quick-setting dental plaster backing was placed to provide rigid support for the impression. Orientation marks were imprinted on the impression's surface; this was then casted immediately to produce the working model. Then, the impression of the contralateral pinna

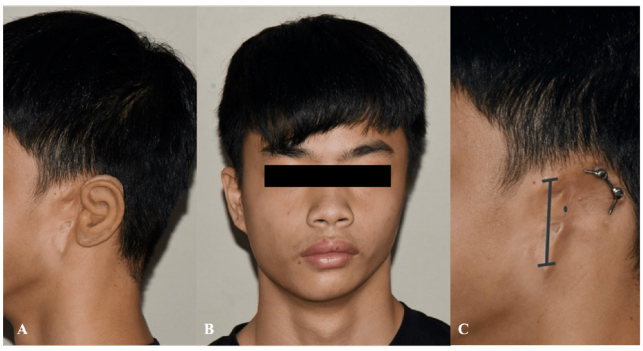

Figure 1: A: Profile photo with existing auricular prosthesis. B: Frontal view showing facial asymmetry. C: Skin marking of external auditory meatus location and the angulation of the long axis of ear with presence of implant bar attachment at the posterosuperior region.

was also made as a reference.

To construct the custom acrylic base, an outline was drawn on the working cast based on the landmarks that was captured during impression procedure. Silicone putty was placed on the attachment to act as spacer for the its housing. Then, a layer of modelling wax spacer was adapted to the outlined area on the working model for the acrylic base. The wax pattern was then converted into a skin coloured custom acrylic base using heat-cured polymethyl methacrylate (BasiQ 20, Vertex Dental, Netherlands) mixed with acrylic paint (Acrylic Paint, Reeves, UK). Perforations were made on its anterior border to aid retention for the silicone elastomers (Fig. 2A and 2B). A mirror image technique was practiced in constructing the wax pattern using the diagnostic cast of the contralateral ear as a guide.

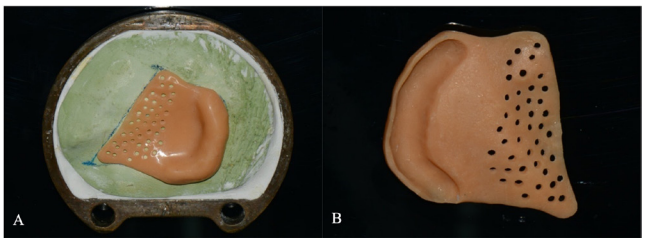

Figure 2: A: Photo of custom acrylic base fabricated with perforations to retain the silicone prosthesis. B: The fitting surface will house the implant bar-attachment

The wax pattern was attached to the acrylic base according to the predetermined position. The position and orientation were verified chairside (Fig. 3A,3B and 3C). The alignment of prosthesis was verified with the use of a goggle, and minor texture and sculpting adjustment were also made. The base skin shade was determined during the try-in visit. Silicone manipulation was carried out according to the manufacturer's instructions (2006 Silicone Elastomer, Factor II. Inc, Lakeside AZ, USA) with functional intrinsic colours and fibre flocking (Rayon Fiber Flocking, Factor II. Inc, Lakeside AZ, USA). During the insertion visit, skin markings were made as a guide to position the prosthesis during a chairside pick-up procedure. Then, the new clips were picked-up using

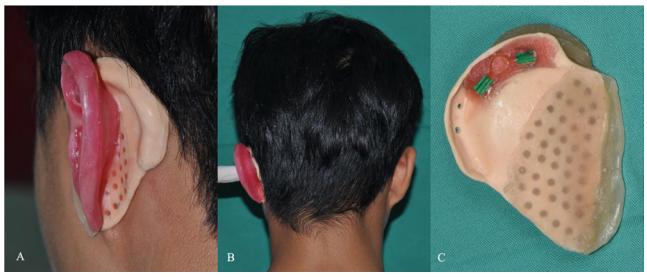

Figure 3: A: Ear wax pattern was attached to the custom baseplate chairside. B: Comparison to the contralateral ear during try-in. C: Clips position on the acrylic base.

luting composite (Quick Up®, VOCO America Inc, USA). Retention and fitting of prosthesis were verified by asking patient to perform facial movement including condylar movements, smiling, maximum mouth opening and talking. The position of the prosthesis was aligned with his contralateral ear (Fig. 4A and 4B). External staining process was carried out followed by sealant application.

He was advised to clean the prosthesis with moist and clean cloth daily and avoid wearing the prosthesis during contact sport activities. Patient had also been asked to clean the peri-abutment skin with single tufted toothbrush or cotton bud with 0.12% chlorhexidine on a daily basis. The patient was very pleased and satisfied with the outcome of the treatment which gave him more confidence when wearing the prosthesis.

Figure 4: Post-treatment profile photos. A: Lateral view. B: Posteroanterior view

DISCUSSION

The standard of care for maxillofacial prosthetic rehabilitation prior to the introduction of craniofacial implants was either an adhesive-retained or a mechanically retained auricular prosthesis. The adhesive-retained prosthesis proved to be unideal in terms of predictable retention and frequently created challenges in prosthesis orientation. Implant retention is now considered the optimal choice in many situations as it improves prosthetic retention and stability, increasing the patient's confidence and sense of security. Attachments aid in the proper positioning of prostheses, allowing patients to insert them more easily.

The major challenge in this case is the malposition of the implant-retained prosthesis which could be due to the migration of the implants during craniofacial bone growth. The mastoid portion of the temporal bone will grow antero-inferiorly and push the tympanic part away (5). Consequently, external auditory meatus will migrate away from the position of the osseo-integrated implants, hence, changing the position of the attached auricular prosthesis on the implants. The ideal position of the auricular implant from the external auditory meatus is about 20mm (1). However, the distance is more than 30mm in the present case. This complication may be avoided by attempting implant placement after puberty period (5).

Apart from the effect of growth, the malposition of the implant retained auricular prosthesis could also be caused by the misposition of the implants during the surgery. Wang revealed that common problems for locating implant positions for young children include a lack of soft tissue landmarks and minimal bone thickness (3). Clinical manifestations of congenital facial deformities vary greatly. They often have abnormal bony structures around the defect areas. Maxillary, temporal, and malar bones on the involved side are somewhat reduced in size and flattened. In this case, the patient presented with complete absence of the left pinna and ear canal. These features will make the implant positioning critical and complicated due to anatomical limitation. Pre-operatively, the locations of auricular implants can be predetermined by using Computed Tomographic (CT) data (4) . From the CT scan analysis, a surgical stent can be constructed and used during surgery to ensure precise auricular implants placement.

The position of implants can be corrected surgically following the fabrication of new implant-retained auricular prosthesis. However, in paediatric patients, the impact of surgical invasion and donor-site morbidity can be severe; the collectable volume of autologous cartilage is limited (1). Hence, to avoid surgical interventions, we have fabricated a custom acrylic base which serves as a medium to connect the silicone part of the prosthesis at an ideal positioned away from the implant attachments. The acrylic resin was mixed with acrylic paint to match the colour of patient's skin, camouflaging the baseplate. The use of a custom acrylic baseplate was considered a conservative, fast, feasible and economical solution to overcome the complications without jeopardizing prosthesis' retention.

However, it also possess the common limitations of attachment retained prostheses due to mechanical and bonding failure of the retentive components to the base structure (2). The baseplate size was larger than normal to accommodate prostheses repositioning. Therefore, more surface bearing area was involved. Retention also may be affected during facial motion. Excessive condylar movements will cause gaping at anterior

prosthesis margin as the retentive features were located too posteriorly. Thus, the usage of adhesive will help to minimize the effect. However, prolonged use is not encouraged mainly due to the level of maintenance required during application and cleaning. Another limitation is the noticeable acrylic bulk structure around the helix region. Although, we have masked with skin colour, patient may opt to keep longer hair to hide its visibility.

CONCLUSION

Malposition implant influenced by age related growth and development will be needing frequent prosthesis change. For this case, the custom acrylic base serves as a viable option to repositioned auricular implant-retained prosthesis into a more natural location without compromising its retention.

ACKNOWLEDGEMENT

We would like to thank the prosthodontic laboratory technicians of Oral and Maxillofacial Surgery Department, Hospital Canselor Tuanku Mukhriz for their help and dedication.

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