

A case report on implant retained auricular prosthesis: Bringing back hope and smile

ABSTRACT

Long-term success of a facial prosthesis mainly depends on retention. Most articles relate tissue health to long-term success, not retention. Anatomic undercuts, skin adhesives and implants are important factors to provide sufficient retention. Extra oral implant retained prosthesis have been proven to be a predictable treatment option for maxillofacial rehabilitation. This case report describes the clinical and laboratory procedures for fabricating implant-retained auricular prosthesis using magnets for retention. It describes how an initial planning for implant placement with Hader-bar retentive system was opted out due to intra-surgical situation. The use of craniofacial implants for retention of extra oral prosthesis, such as ears, offers excellent support and retentive abilities and improves a patient's appearance and quality of life. It has been shown in clinical and biomechanical studies that two implants are sufficient to retain an auricular prosthesis. Judicial treatment planning and implant placement according to the available remaining structures is prudent for a successful prosthesis.

Keywords: Auricular prosthesis, magnetic attachment, maxillofacial implant

INTRODUCTION

Maxillofacial prosthetics is an ever-evolving branch with respect to patient compliance in restoring and rehabilitating cranio-facial defects. Craniofacial defect encompasses a huge proportion of newborn babies born with one or combination of various defects. A study conducted in Saudi Arabia indicated 39.3% prevalence of ear, face and neck anomalies in newborn.^[1]

Microtia/anotia is a congenital deformity of external ear with or without hearing impairment. According to "Microtia-Anotia: A Global Review of Prevalence Rates"^[2] 10% children born in India suffer from Microtia.

Medical grade silicones have been traditionally used to rehabilitate these patients with auricular prosthesis. But retention of the prosthesis has been a constant point of concern. Tissue adhesives apart from providing moderate to poor retention also cause problems of reliability, stability, and tissue irritation. Implant retained prosthesis has come out as a savior in this situation and believed to serve twice

more than adhesive retained prosthesis.^[3] Various attachment designed on implants provide acceptable retention (70% in auricular prosthesis according to survey conducted by Hatamleh *et al.*^[3]) and convenience to the patient. However, choosing the type of attachment is critical.

Bar and clip attachment is the most widely used system that offers optimum retention.^[4] Magnetic attachments because of their small size and adequate forces, allow them to be placed within prosthesis without being obtrusive in the mouth.^[5] Comparative studies done by Andréa *et al.*^[4] confirms that bar and clip attachment offers better retention than magnetic attachment however durability of a three clip bar

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and clip attachment and two magnet---magnetic attachment are the same.

These attachments, however, do not restore the hearing ability but they improve the esthetics dissolving the social dilemma for the patient. Also a good retention eases out the concern of patient of accidental fall of prosthesis, boosting confidence.

This case report covers the surgical Implant placement in a young patient suffering with anotia, and rehabilitation with a prosthesis retained by magnetic attachment.

CASE REPORT

A young male patient of age 24 years reported to department of Prosthodontics of a dental institute with complaint of missing left ear. On examination, microtia was observed on the right ear [Figure 1].

Brief case history of the patient was recorded to rule out syndromes related to microtia. A preliminary impression was made with alginate (Imprint, Alginate dental impression material, Dental Products of India) for both the sides. Cast was poured in Type II gypsum product (Dental plaster, Kalabhai) and wax up of the missing auricle was done. From this a radiographic stent using a heat cure clear acrylic was made. Three points of tentative implant placement (11 o'clock, 1 o'clock, and 2 o'clock) were anatomically marked and mini screws were placed on the stent. This stent was stabilized using tapes on the patient and a CT scan was obtained. On the scan, average 5--6 mm bone was evaluated in temporal region at 11 o'clock and 1 o'clock position [Figure 2]. The bone thickness beyond this was less dense for implant placement.

Surgical step: The surgical region was prepared, and the sterilized stent was used to mark the points of insertion of the

implants at 11 o'clock and 1 o'clock position. A post-auricular incision was placed to reflect the full thickness flap. After completing the osteotomy, two Dentium Simple line II® implants of diameter 4.8 mm and length 4 mm were placed in the pre-decided positions [Figure 3].

During the osteotomy, after 4 mm depth in the anterior implant (at 11 o'clock position), dura could be visualized. After confirmation of intact dura, under loop magnification and illumination Abgel was placed as temporary barrier and implants of 4 mm were placed at both the regions. A post operative scan showed altered angulation of anterior implant by approx. 10 degrees. With a proper coverage of medication (antibiotics-analgesics) patient was relieved and recalled after 4 months.

Second stage surgery was initiated to place healing abutment of diameter 6.5 mm and length 6 mm on the implant. After 2 weeks, patient returned for impression. The anterior healing abutment showed tissue growth over the abutment with signs of local inflammation. Topical antiseptic (Soframycin® skin cream) was prescribed and patient was recalled after another week.

Later healing abutments were replaced with transfer copings and a primary impression was made using alginate. An acrylic custom tray (for a definitive impression using a putty and light body) was fabricated on the primary cast. Before pouring the final cast in Type IV gypsum product [Figure 4], light body

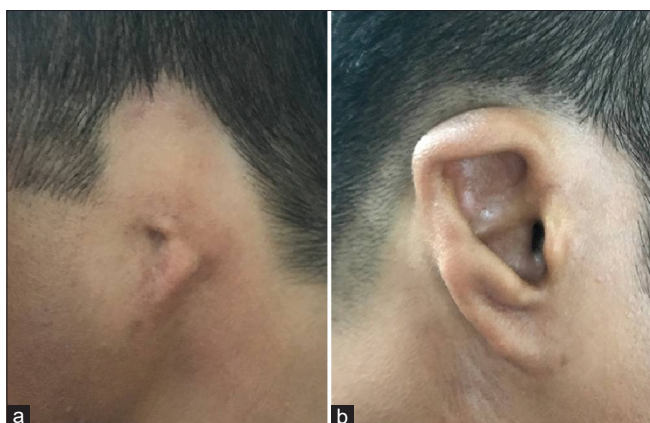


Figure 1: (a) Close view (b) Full mouth view, swelling in palate bilaterally



Figure 2: Preoperative CBCT

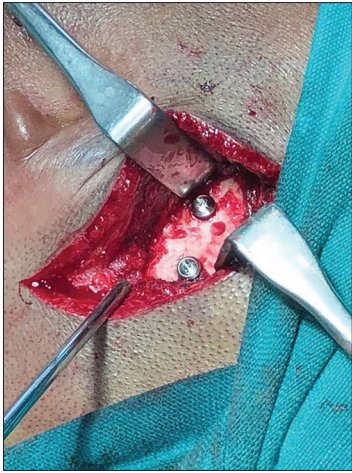


Figure 3: Placement of implants

was poured to replicate the soft tissue till the transfer coping and implant analog junction.

Transfer copings were removed and magnetic keepers were placed on the cast. The magnets were attached to their keepers and a stent encapsulating the magnets was made in wax. This was converted into a heat cure clear acrylic stent. The entire assembly was tried on the patient to check for a passive fit [Figure 5].

On this assembly wax pattern was made keeping all the measurements of axis, level, and distance from the normal ear (according to Tolleth^[6]) into consideration.

After successful try in, the wax pattern was invested and packed with Cosmosil maxillofacial silicone by Technovent[®] USA following the manufacturer's instruction. Color matching was done using internal as well as external stains [Figure 6].

Final fit in of the prosthesis with the assembly of stent and magnet was done. Patient was recalled after 1 week, 3 months, 6 months and 2 years. At 3 months a CBCT was taken to evaluate the bone surrounding the implants, which was found to be adequate [Figure 7].

At 2-year recall, it was observed that the prosthesis lost its color in sun due to the nature of the patient's job [Figure 8]. However, the tissue health and the magnetic connection were totally fine. Extrinsic stains were applied to restore the color of the patient's prosthesis.

DISCUSSION

Retention of auricular prosthesis has gone through various phases of scrutiny. With implant retained prosthesis providing an edge over others in aesthetics and patient compliance,



Figure 4: Final cast with magnetic assembly

choosing attachment system for it is complicated. Since retention and durability of the prosthesis constitute the two main factors responsible for patient satisfaction and success of the rehabilitation, various studies have been conducted on these systems to evaluate the wear and tear of components involved.

Bar and clip type gained maximum popularity due to excellent retention it offered. However, loading and unloading of prosthesis causes minor dislocation and hence deformation of the retention system. This leads to accelerated loss of retention and reduced clinical longevity.^[7]

In the present case anterior implant placement was juxta positioned with the dura mater. Thus, choosing magnetic retention here was justified for maintenance of hygiene; mechanical factors (on anterior implant) and thick peri-implant tissue.^[8] Magnetic attachments offer economical, hygienic, convenient to use and easy repair/replacement options.^[9]

Magnet-retained prosthesis got impetus several decades ago when a horseshoe shaped magnet was used in a patient to retain maxillary denture with an obturator.^[10] Back then cytotoxicity (caused by the steady magnetic field around the magnets) and corrosion of magnetic alloys and their corrosion products were the unaddressed issues.^[11] But now with rare earth magnets and castable magnets these issues are shed off. Brewer^[12] also states "the static magnetic field induced by a dental magnetic attachment has little effect on the human body and tissues"

Also the contemporary closed magnetic systems offer safe environment. In closed field magnets, the keepers contain the magnetic flux and the North and South Pole both can be used efficiently for attachment purpose.^[13]



Figure 5: Evaluating the stent on the patient



Figure 6: Final prosthesis



Figure 7: Postoperative CBCT

Due to the altered angulation in the anterior implant placement, mild complications were encountered in the healing cap and magnetic keeper placement. Due to unavailability of healing cap of more than 6 mm in the implant system, inflammatory tissue growth was seen over the healing cap. The tissues were treated with topical antiseptic ointments to curb the inflammation before placing the magnetic keeper.

The magnets were picked in heat cure acrylic stent. This was done to partially splint the two implants. The bonding between the acrylic and the maxillofacial silicone has been



Figure 8: 2-year follow up

a topic of discussion. Many studies have been conducted to determine the need of a primer in bonding acrylic stent and the silicone prosthesis. Primer acts as a coupling agent between acrylic and silicone material which activates the surfaces by any of the following methods^[14]:

- *etching
- *promoting hydrogen bonding and covalent coupling
- *increasing the wettability of the substrate
- *by impregnating the surface layer with the polymeric ingredients

It has demonstrated exceptionally good bond strengths for acrylic and silicone. On the other hand, adhesion of acrylic and silicone via undercuts in silicone has also given acceptable results in studies conducted by Craig and Gibbons^[15] and Shetty US.^[16]

With the ever-evolving world, we can now look up to tissue engineering, use of biomolecules etc., for the next generation of extra oral prosthesis. Neo-cartilage is being constituted in a predetermined shape and in complex 3D structures. This is done by using cell transplantation on polymer

constructs. Since these technologies are in their budding stage comprehensive *in vitro* and *in vivo* studies are required before these become a clinical norm.^[17]

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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