

## Auricular Prosthesis in Burn Reconstruction

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### Introduction

The auricular prosthesis or epithesis is an artificial total or subtotal reconstruction of the auricle. The prominent location of the ear, and its delicate structure make it susceptible to burn injury that usually occurs in conjunction with facial burns, damaging the auricle and local tissues [1]. The goal for ear reconstruction is to restore the aesthetic appearance and provide a superior sulcus to support eyewear [2]. The cosmetic importance of the ear should not be underestimated and dissatisfaction with deformities can result in depression and a lower quality of life [3]. Surgical reconstruction is currently a multistep process utilising autologous costal cartilage, local flaps or MEDPOR implant [4,5]. Prosthetic reconstruction offers a viable alternative [6,7]. These indications include patient choice, failed autologous reconstruction, inadequate local soft tissue and patient comorbidities [8].

The decision on reconstructive technique occurs in a multidisciplinary team setting. Hearing is also an important consideration.

### Design of Prosthesis

The goal is to make a prosthesis that matches as closely as possible to the normal ear. Currently, moulding and sculpting using the normal ear as a template is still widely used. The first step, impression taking, consists of making a plaster cast of the normal ear. This is then used as a template to create a wax prototype. The second stage consists of sculpting and designing the wax prototype to best fit the patient's facial features. This stage involves close discussion with the patient to customise the wax prototype according to personal preferences. Next, a dental mould is applied around the wax model to set the final shape of the prosthesis. Silicone is painted on the outside and also used to fill the mould. At this stage, the silicone is made to match skin colour. Lastly, during the final fitting, the prosthesis will be externally hand tinted to match the tiny superficial blood vessels and freckles adjacent to it. This whole process is slow, time-consuming and often requires the patient to be present for consultation for long periods.

Fortunately, recent innovations in digital technology are revolutionising the way prosthetic ears will be produced. The use of computer software, 3D photography, and rapid prototyping has been successfully reported [9,10]. With such developments, the speed of making the prosthesis can be greatly increased and patients can expect to have their prosthesis made within days instead of weeks that it usually takes. However, this method of producing prosthetic ears is still in its infancy and there must be further improvements in computer software and 3D imaging equipment in order for it to become standard practice.

### Retention Techniques

#### Adhesives

The most difficult problem in using a prosthetic ear is for it to be retained in its desired position optimally without complications. Traditionally, the method of retention is the use of adhesives. This often provides unsatisfactory retention and is associated with complications such as chemical irritation of the skin. Furthermore, the daily routine of

application and removal of the adhesive also speeds up the rate of wear and tear of the prosthesis.

### Osseointegrated implants

The use of Osseo integrated implants to retain auricular prosthesis was first attempted in 1979. It followed the introduction of the use of end osseous implants in bone conduction hearing aids in the 1970s. Since then it has grown in popularity and many papers have reported its success. Some of its advantages are to provide more stability and better retention compared to adhesive, giving patients a stronger sense of confidence. Aesthetically, it also gives a better result as it allows a finer feathered margin.

Osseo integrated implants make use of 2 types of retentive mechanism, namely magnetic or bar and clip. The number of bone implants can range from 2 to 4 and this is largely dependent on the clinician and the individual patient.

The implants are inserted surgically and the mastoid region is the favoured recipient. Firstly, implant sites are marked out and they should be at a position that is at least 20 millimetres away from external acoustic meatus and 15 millimetres from each other. When using only 2 implants, the ideal position to place them would be at the 9 and 11 o'clock position. Secondly, use a curved incision over the mastoid region about 30 centimetres posterior to approximate position of the external auditory meatus. Thirdly, reflect the skin and subcutaneous tissue to expose the periosteum. Incise the periosteum, expose the bone surface and insert the implants where the surgical markings were. Care should be taken to minimise trauma to prevent heat injury to the adjacent bone and to ensure stable Osseo integration.

Implantation can be done in one or two stages. A one stage procedure is favoured over a two stage procedure because a two stage procedure potentially disrupts the blood supply to the area due to scar tissue formation. Finally the recovery screws are placed and the skin incision is closed using wire sutures. Osseo integration will take about 4 months, after which the recovery screws are taken out and the prosthesis is placed.

### Limitations

Auricular prostheses are most frequently used to reconstruct congenital deformities (65.2%) and post tumour resection (26.1%) compared to burns (2.2%) [11]. Understandably, most published papers on auricular prosthetics focus on the main two indications.

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Plastic surgeons face great challenges in reconstructing post-burn deformities due to the distorted anatomy after recovery. They face even greater challenges using prosthesis for this purpose because of the lack of literature. Papers that had tackled the issue of post burn deformity reconstruction had focused on using surgical techniques using autologous tissues [12]. In the future however, we feel that the use of prosthetic reconstruction in burns patients will become increasingly popular as it becomes more acceptable to patients because of improved quality from technological advances.

## Conclusion

The use of prosthesis in reconstructing an auricular deformity has proven to be very useful and effective in achieving aesthetic and functional goals. In doing so, it can also improve patients' confidence, mood and quality of life [3]. For the victims of burns injury, it can be a great aid in their rehabilitation.

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