

Restoration of Ear Defects by Prefabricated Radial Forearm Flap

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Summary: The case report involved a 36-year-old man. He was injured in a road traffic accident and had extensive third- and fourth-degree facial burns over the right side of his face, with complete loss of his right auricle. We performed a free flap coverage of the right face with the anterolateral thigh (ALT) flap. The reconstruction of his auricle was performed by culturing a cartilage framework on the forearm and transferring it straight to the original location to rebuild the new ear as free flap. Results were assessed 12 months after surgery. The follow-up is still short, but the patient is satisfied with the results achieved. (*Plast Reconstr Surg Glob Open* 2020;8:e2616; doi: [10.1097/GOX.0000000000002616](https://doi.org/10.1097/GOX.0000000000002616); Published online 20 January 2020.)

INTRODUCTION

Simultaneous reconstruction of the face and the auricle is a difficult challenge, especially with the type of extensive injuries that devastates total auricular and soft tissue over one side of the face. The facial reconstruction requires a skin flap of sufficient size and features that are suitable for the face. After coverage of the facial damage with a skin flap, the restoration of a fully satisfactory, complete auricle depends on local tissue and skin conditions.^{1,2} In cases of severe damage of the skin and soft tissue and of severe burn damage with destruction of the arteria temporalis superficialis, a prosthetic reconstruction might be the only reasonable solution.^{3,4} The reconstruction of the auricle by culturing a cartilage framework on the forearm and going straight to the original location to rebuild the new ear is an especially difficult technique and, therefore, extremely rare. However, for patients who do not accept a prosthetic reconstruction, this technique could be a great solution. We obtained the patient's written informed consent for the reconstruction of his auricle by culturing a cartilage framework on the forearm. We had performed and obtained good results. He expressed complete satisfaction with the outcome of treatment given the severity of his initial injury.

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CASE REPORT

The 36-year-old man presented with no prior medical history. He was injured in a road traffic accident. As a result, he had extensive third- and fourth-degree facial burns over the right side of his face (Fig. 1).

On July 25, 2018, we took him to the operating room for required debridement to remove the extensive necrotic tissue from the burn and performed free flap coverage of the right face with an ALT flap. He had lost his complete right auricle, so required 2 subsequent surgeries (on August 9, 2018, and November 15, 2018) to reconstruct his auricle and optimize the contour of his right facial flap.

Technique for Reconstruction

We performed free flap coverage of the right side of the face. An ALT flap (25 × 20 cm) was harvested from the right thigh. The facial artery and facial vein were used as recipient vessels with end-to-end microsurgical anastomosis using 8.0 nylon (Fig. 2). A split-thickness skin graft (7 × 15 cm) was used for donor site coverage.

After 2 weeks of coverage of the right side of the face, the total reconstruction of the auricle required an operation in 2 stages. The first stage involved creating a skin pocket at the site of the forearm by reshaping the available tissue and thinning the skin to mimic the ear skin. Rib cartilage was then harvested in 3 pieces, which were carved and wired together with fine, stainless steel wire to produce a very detailed auricular structure. The structure was then inserted in the pocket, and gentle suction was applied to enable the skin and the auricle structure to come together (Fig. 3).

After 12 weeks, the second stage was performed. The new auricle and the right forearm flap were then harvested together and placed into position at the head as a free flap. The facial artery and facial vein were used

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Fig. 1. Patient with facial burns over the right side of his face and loss of the total auricle.



Fig. 3. Culturing a cartilage framework on the forearm.



Fig. 2. Performed free flap coverage of the right side of the face.



Fig. 4. Postoperative image about 7 months after surgery.

as recipient vessels with end-to-side microsurgical anastomosis using 8.0 nylon. The new ear was lifted into place with a piece of cartilage behind it to support its position (Fig. 4).

DISCUSSION

In cases where the patient is unable to have a reconstructed auricle due to a severe damage of the skin and soft tissue in the face and the neck, tumor resection and especially severe burn damage with destruction of the arteria temporalis superficialis, a prosthetic reconstruction might be the only reasonable solution.^{3,4} Infections and fungal infections when exposed to implants,^{5,6} inflamed and loose screw pins, color change of materials, drop of fake ears when colliding or participation in sports activities are common and complex problems arising from the prosthetic restoration.^{2,3,5} The alloplastic ear will not be worn until complete skin infection is resolved and skin care where contact with a lifelong implant is forced.^{4,6} This makes it difficult for many patients to accept prosthetic restoration, especially in young people.⁷

In our case, the total reconstruction of the auricle could not have been performed by using rib cartilage as was described by Nagata⁸ (1993) because it required an operation in 2 stages. It could also not have been performed by most current techniques because of severe damage to the skin and soft tissue and because of severe burn damage with destruction of the arteria temporalis superficialis. Additionally, our patient did not accept an auricular prosthetic.

We thus planned a combined use of ALT flap and prefabricated radial forearm flap (culturing a cartilage framework on the forearm and transferring it straight to the original location to rebuild the new ear as free flap), which has 2 significant advantages: (1) this method does not depend on local tissue and skin conditions of the face

and (2) the restoration of a fully satisfactory, complete auricle is shortened to one stage.

Our method led to a successful reconstruction of extensive injuries that devastate total auricular and soft tissue over one side of the face. This method embodies hybridization of two 20th century breakthroughs in plastic surgery, namely, microsurgery and culture bioengineering, and appears to be a safe and viable operative plan for the treatment of large complex auricular defects in patients who do not accept a prosthetic reconstruction.

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