

Partial Ear Reconstruction with a Prelaminated Induced Expanded Radial Artery Flap

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Summary: A 76-year-old man underwent an extensive resection for squamous cell carcinoma 2 years before, resulting in the loss of the superior half of the right ear, without any attempt at reconstruction. The decision was to reconstruct with a combined suprafascial tissue expansion, an alloplastic framework fabricated with porous polyethylene, and a radial artery free flap. At 1-year follow-up, the patient was satisfied with the result. We believe this represents a novel approach to be considered for partial ear reconstruction. (*Plast Reconstr Surg Glob Open* 2021;9:e3344; doi: [10.1097/GOX.0000000000003344](https://doi.org/10.1097/GOX.0000000000003344); Published online 12 February 2021.)

INTRODUCTION

Reconstruction of the ear has always been a challenging problem facing plastic reconstructive surgeons.¹ Several methods utilizing local tissue have been described in the literature,² but in the setting of a larger defect requiring both cartilaginous support and soft tissue coverage, microsurgery may represent an available option.

The most frequent difficulty remains in the thickness of the skin, which leads to inadequate ear definition. In 2004, Chiang described a combined approach using tissue expansion and a costal cartilage framework prelaminated in the forearm, followed by microsurgical transfer to reconstruct a scarred microtia.¹

This study presents a case report involving reconstruction of a partial ear defect by combining radial suprafascial tissue expansion, an alloplastic framework fabricated with porous polyethylene (Medpor; Porex Surgical, Inc., Atlanta, Ga.), and a radial artery free flap.

CASE REPORT

A 76-year-old man underwent an extensive resection for squamous cell carcinoma 2 years before, resulting in the loss of the superior half of the right ear (4 x 5 cm) without any attempt at reconstruction (Fig. 1). The patient presented for consultation to restore his ear function so that he would be able to wear glasses again and also

for aesthetic appearance. Several reconstructive options such as ear prosthesis, local flaps, and microsurgery were discussed with the patient, and he ultimately decided to undergo a microsurgical reconstruction.

In the first stage, a 100 cm³ rectangular tissue expander (Silimed Ltda., Brazil) was implanted in a suprafascial pocket of his distal forearm, and the radial artery and cephalic vein were ligated to delay the flap. In the second stage, 4 months later, the expander was replaced with a porous polyethylene frame (Medpor; Porex Surgical, Inc., Atlanta, Ga.) shaped by the author to recreate the anatomic structure of the ear. A suction drain was placed to maintain negative pressure and conform the framework to the flap (Fig. 2).

In the third stage, 5 months later, the partial ear-shape fabricated from porous polyethylene prelaminated composite radial artery free flap was transferred to reconstruct the ear (Fig. 3). The vascular anastomoses were performed in an end-to-end fashion to the facial vessels (10-cm pedicle length). The posterior side was reconstructed with a post-auricular skin flap. The donor site was closed using a full-thickness skin graft from arm with primary closure of the region. (See Video [online], which displays the patient with a defect and how the reconstruction was performed in 3 stages: first the expansion of the radial flap, then the implantation of the porous polyethylene structure, and then, the reconstruction with the prelaminated composite radial artery free flap.) Postoperative care was performed only with Vaseline gauze. The patient had an uneventful recovery and was very satisfied with his reconstruction 1 year following completion of his reconstruction (Fig. 4).

DISCUSSION

In this case, the author made a prelaminated radial artery flap, and the concept of flap prelamination has

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Fig. 1. The defect size in the superior half of the right ear.

been well-described, where a 3-dimensional structure is implanted into a reliable vascular bed that, once matured, can then be transferred to the recipient defect.³

The idea of a suprafascial tissue expander and implantation of the ear framework was to improve the aesthetic outcomes, as the skin of the arm is still quite thick, which obscures the definition of the fine details of the underlying framework.

Although there is considerable debate about the best material to create the structural framework, synthetic materials have been widely used, with lasting results.⁴⁻⁶ Some advantages of using a synthetic material are ease of use, limited morbidity of the donor site, and an earlier age for reconstruction because it is not necessary to wait for the patient to have sufficient costochondral cartilage before embarking on reconstruction. Reinisch has demonstrated excellent outcomes with minimal complications in over 1500 operations.⁷ In this case, the author decided to utilize porous polyethylene to fabricate the framework because of the patient older age and the calcification of the costochondral cartilage.

Aside from the prelamination and vascular delay, the microvascular aspects of the operation are worth noting. While the superficial temporal vessels were in close proximity to the defect, the size of both the artery and vein was quite diminutive, which would have created a large size mismatch, and they also appeared to have calcification. Although there was more than sufficient pedicle length



Fig. 2. Porous polyethylene framework on the prelaminate construct. Negative suction was placed to maximize the definition.

from the radial forearm flap, we opted to use the facial vessels, which were readily accessible without the need for vein graft.

The author opted to design this flap to place the framework more superficially to maximize the definition of the construct and to preserve more fascial coverage of the tendons. By having more coverage of tendons, this potentially reduces the donor site morbidity and facilitates the take of the full-thickness skin graft.

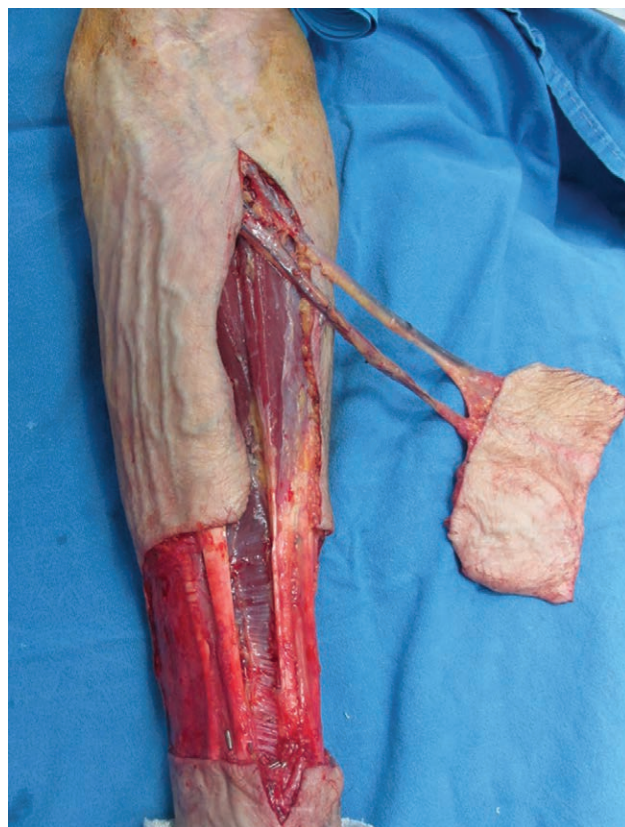


Fig. 3. Prelaminated composite radial artery free flap.



Fig. 4. Ear reconstructed after 3 months.

The disadvantages of this flap are the multiple stages that it requires and all the complications associated with a microsurgical reconstruction; the pros are the use of a

prosthesis like polyethylene, when rib cannot be used, and the aesthetic result in both the donor and recipient area.

CONCLUSION

We believe this represents a novel approach to be considered for partial ear reconstruction in selected patients.

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