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# A new strategy for total auricular reconstruction using prelamination of an extended retroauricular flap with tissue expansion

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## KEYWORDS

Microtia;  
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**Summary** *Background and aim:* To accomplish total ear reconstruction with aesthetic appearance is a great challenge for plastic surgeons worldwide due to insufficient skin coverage. A retroauricular fascial flap and skin graft technique are commonly used, but the results obtained are not satisfactory due to color mismatch, severe edema, and donor-site morbidity. Here, we describe a novel strategy for total ear reconstruction, utilizing an extended retroauricular flap prelaminated with tissue expansion to obtain enough skin for ear reconstruction.

*Methods:* About 2 months before ear reconstruction, a kidney-shaped tissue expander was inserted at the mastoid region subcutaneously. The retroauricular skin became enlarged and thinner in 2 months after expansion. Next, the expander was removed and the retroauricular flap was extended by dissecting the surrounding scalp subcutaneously. By mobilizing the scalp-extended retroauricular flap, we could encapsulate the entire framework with thin and non-hair-bearing skin.

*Results:* From August 2014 to September 2015, 36 microtia patients had undergone ear reconstruction using the novel strategy. Satisfactory aesthetics along with fine structure, symmetry, and maintenance of the auriculocephalic angle was achieved in all patients.

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**Conclusions:** Using our novel strategy, we can obtain satisfactory aesthetic outcomes by fully mobilizing the expanded skin without additional morbidities of the donor sites. Patients are satisfied with the vivid ear contour and lack of groin scar.

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## Introduction

Total auricular reconstruction is one of the greatest challenges for plastic surgeons worldwide. A sufficient skin envelope and sophisticated auricular framework are the two important factors for a successful auricular reconstruction.<sup>1–3</sup> Tissue expansion will theoretically provide additional soft tissue to cover the cartilage framework in creating a three-dimensional and contour-attenuated ear.<sup>4–6</sup> During tissue expansion procedure, the superior match of color and texture along with recovery and maintenance of sensations need to be well considered for plastic surgeries including auricular reconstruction. However, the expanded skin with such merits is not enough for the coverage of the posterior surface of the framework for total auricular reconstruction; hence, retroauricular fascial flaps and skin grafts are adopted generally. In addition, patients are not satisfied with the donor-site mobility and color mismatch.<sup>7</sup>

Flap prelamination is a process of binding of distinctive layers to create a novel anatomic three-dimensional laminated structure without interfering with the native axial blood supply.<sup>8,9</sup> This process is widely used in complicated reconstructions where conventional methods are not applicable.<sup>10–12</sup> In order to envelop the entire framework with enough thin skin, we invented an extended retroauricular flap, consisting of central mastoid skin and the surrounding scalp. In addition, we prelaminated the flap through tissue expansion to make the central non-hair-bearing mastoid skin thinner and enlarged. In this study, we will present the process and performance of our novel strategy on total ear reconstruction using the extended and prelaminated retroauricular flap.

## Patients and methods

From August 2014 to September 2015, 36 congenital microtia patients had enrolled for undergoing ear reconstruction using this new strategy at our center (Table 1). The patients included 23 men and 13 women, aged 5–30

years (average 11.3 years). Left-side microtia was reported in 14 patients, (33.3%) right-side microtia in 18 (46.6%), and bilateral microtia in four. According to Nagata's definition, typical lobule-type microtia was found in 30 patients (80%) and concha-type microtia in six (20%).

## Surgical procedures

Currently, we persist in using autogenous costal cartilage for creating the framework for ear reconstruction. An extended and prelaminated retroauricular flap has been used to obtain sufficient skin to encapsulate the entire framework.

### 1. Prelamination of the extended retroauricular flap using tissue expansion

The mastoid skin was prelaminated via soft tissue expansion for obtaining enough skin to cover the entire framework in ear reconstruction. Briefly, a 3-cm incision line along the hairline was made on the scalp. A subcutaneous pocket was then dissected above the retroauricular fascia. Once strict hemostasis was achieved, a 50-ml kidney-shaped expander was inserted into the subcutaneous pocket. The inflation valve was placed beneath the skin of the neck, and a negative-pressure drainage device was inserted under the expander to prevent postoperative hematoma. The inflation began 7 days after operation. Saline solution of 4–6 ml was injected thrice per week until the expansion volume reached 60–70 ml. The whole procedure was completed in 2 months.

Ear reconstruction was performed following the expansion procedure. The first incision was about 3 cm long, along the posterior edge of the expanded skin. Through this incision, we entered the capsule and removed the expander. Then we used a scalpel to dissect the surrounding scalp to 3 cm behind the hairline at the subcutaneous level (Figure 1). The thickened capsule besides the edge of the expander was removed using ophthalmic scissors. Thus, the extended retroauricular flap was constructed: the central mastoid area was enlarged and thinner through tissue expansion, while the surrounding scalp made the central expanded skin much looser and transferable. The area of skin obtained via an extended retroauricular flap was similar to that obtained by subfascial expansion with an 80-ml expander; however, the central skin was much thinner, which is much similar to the normal ear skin (Figure 2-2).

### 2. Ear reconstruction using prelaminated retroauricular flap and autogenous costal cartilage

**Table 1** Patient data.

Sex of patient (%)	Type of microtia (%)	Patient age range (%)
Male 23 (63.9%)	Right 18 (50%)	5–12 23 (63.9%)
Female 13 (36.1%)	Left 14 (38.9%)	13–18 9 (25%)
	Bilateral 4 (11.1%)	19–30 4 (11.1%)

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