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Microtia reconstruction using tissue expanders without skin grafts from groin region

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Summary *Backgrounds:* Microtia reconstruction is a multistage procedure for which a variety of surgical strategies have been devised. Most surgeons continue to employ the long-established two-stage procedures described by Nagata and Firmin, which use autogenous rib cartilage for auricular reconstruction. The groin area is the most common donor site for full-thickness skin grafts in auricular elevation, the second stage. In this article, we present a new method that uses tissue expanders before auricular elevation, which provides the necessary skin and creates satisfactory results without groin scarring.
Methods: The surgical procedure is composed of three stages. In the first stage, we performed the rib-cartilage graft as previously described. In the second stage, a 45-ml rectangular tissue expander was inserted subcutaneously at the postauricular mastoid region. The skin flap was expanded for 3—4 months before auricular elevation. In the next stage, the expanded postauricular skin flap was advanced to the mastoid area and set into the auriculocephalic sulcus after removing of the tissue expander. The estimated remnant skin flap and dog-ears were marked and then excised. After a defatting procedure, the harvested skin was reused for the elevation procedure, obviating the need for full-thickness skin from the groin.
Results: Between January 2011 and January 2014, 62 cases of microtia were treated with our method. The final results showed no major complications and satisfactory aesthetics, with fine structure, symmetry, maintenance of the auriculocephalic angle, and erect stability of the cartilage framework.
Conclusion: Various procedures using tissue expanders have been introduced in microtia reconstruction. However, they utilized complicated strategies for tissue expanders or obtained

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suboptimal aesthetic results. With our simple and reproducible methods, we can obtain satisfactory aesthetic results using expanded skin without the additional morbidity of a donor site. Despite the addition of an operation procedure, patient satisfaction with regard to the lack of groin scarring was much higher than expected.

Introduction

Microtia reconstruction with autogenous tissue is a challenging issue in plastic surgery. Various surgical procedures have been devised to obtain satisfactory results, which require both a contour-attenuated ear framework as well as sufficient soft tissue for coverage of the framework.[1,2]

Nagata and Firmin described a two-stage reconstruction to insert the cartilage framework by allowing early repositioning of the lobule and making tragus in the first stage, and the elevation of the grafted ear in the second stage, supporting the cartilage framework with another costal cartilage block.[3,4] Many surgeons have adopted this two-stage procedure or a variation of it, and tried to make a more flexible, thinner, and delicate three-dimensional ear.

The tissue expander is an efficient tool to create thin, well-vascularized tissue for coverage of the ear framework during reconstruction. Neumann first applied the tissue expansion method in 1957, but his effort was less than successful.[5] Brent reapplied the tissue expander in microtia reconstruction in 1980.[6] Subsequently, many surgeons have tried to use tissue expanders to obtain sufficient soft tissue.[7,8] However, they often required complicated procedures using the tissue expander, or obtained suboptimal aesthetic results due to a thick capsule of expanded skin and difficulties in expression of a three-dimensional structure, especially for coverage of the posterior surface. Here, skin grafts should be performed, as the surgeons could not utilize the expanded skin to cover the three-dimensional ear. In addition, patients had suffered donor-site scarring caused by the additional skin graft harvest.

We inserted a tissue expander between the procedures: rib-cartilage graft and auricular elevation to remedy the shortcomings of the tissue expander technique. In our process, the expanded skin is applied at the posterior sulcus of the ear to improve the stability and attenuate projection. Then, the remaining skin, instead of full-thickness skin from the inguinal area, is draped at the posterior surface for the elevation procedure. This leads to satisfactory results that show a contour-attenuated ear with minimal complications.

Patients and methods

Between January 2011 and January 2014, we treated 62 cases of microtia with a three-stage procedure using tissue expanders. These patients were composed of 41 males and 21 females, with ages ranging from 10 to 30 years (mean 14.7). Forty-two cases (68%) were lobule-type microtias and 19 cases (32%) were concha-type microtias, as defined by Nagata (Table 1).

Surgical procedure

We performed a three-stage operation. In the second stage, a tissue expander is inserted in the mid-posterior region of the helix at the mastoid area through the subcutaneous pocket. In our method, the expanded skin has two roles in the elevation procedure — it both supports and attenuates projection and provides coverage of the posterior surface of the framework. Telephone surveys were performed in patients at least 6 months after elevation procedure. Twelve patients in the tissue expander group were excluded from the satisfaction survey because of their short follow-up period. The questionnaire was composed of five questions that addressed satisfaction regarding procedures and aesthetics: (1) Would you select the "ear reconstruction" you had again? (2) Would you choose to have the same type of procedures (using tissue expanders) you had again? (3) Would you recommend the same surgical procedures you had to others? (4) Are you satisfied with shape of the ear? (5) Do you think that it is similar with normal ear in shape, size, color, and texture?

The gathered variables of the tissue expander and conventional two-stage ear reconstruction group were compared. The statistical significance of differences was evaluated using $\div^2$ test ($p < 0.05$) or Mann—Whitney test. Statistical analysis was performed with Statistical Package for the Social Sciences (SPSS) version 18 (SPSS Inc., Chicago, IL, USA).

Tissue expander insertion

A 3-cm incision line was made on the margin of the ear framework. The incision was deepened to the subcutaneous layer, and the subcutaneous pocket was dissected. The dissection proceeded on the scalp of the mastoid area when enough space was obtained for the tissue expander, and the

Table 1 Patient demographics.

Sex of patient (%)		Type of microtia (%)		Patient age range (%)	
Male	41(66.1)	Right	29(46.8)	10—12	20(32)
Female	21(33.9)	Left	33(53.2)	13—18	36(58)
				19—30	6(10)
Total	62(100)	**Total**	62(100)	**Total**	62(100)