Sulcus Construction in Microtia Repair

A Retrospective Comparison of Different Techniques

Shay I. Duvdevani, MD; Ralph Magritz, MD; Ralf Siegert, MD, DDS, PhD

Objective: To compare the auricular projection results across 3 different techniques of sulcus construction in microtia repair (using a temporoparietal fascial flap, a retroauricular fascial flap from the mastoid region, or a superficial muscular aponeurotic system advancement flap).

Methods: All the patients had been photographed at least 3 months after the second stage (construction of the retroauricular sulcus) in auricular reconstruction for microtia. The auricular projection of each patient was measured, and the results of 3 different techniques were compared.

Results: No statistically significant differences in the auricular projection results were observed among patients operated on using the 3 techniques.

Conclusions: The superficial muscular aponeurotic system advancement flap is suitable for patients requiring middle ear and auricle reconstruction. The performance of this flap is easier, quicker, less expensive, and associated with fewer perioperative complications compared with the other 2 techniques described herein.


Primary microtia repair is composed of 2 to 3 stages. The first stage is design and implantation of a rib cartilage auricular framework. In this stage, rib cartilage is harvested from the chest, and a 3-dimensional auricular framework is built and placed under the skin of the planned auricle site. The use of the auricular framework was reported in 1993 by Nagata1 and is internationally favored.

In regular auricular reconstruction for lobule-type and concha-type microtia, the second stage is construction of the retroauricular sulcus (possibly with middle ear reconstruction). In this stage, a full-thickness skin graft2 is harvested from the chest area, and a cartilage buttress for the auricle is placed medial to the reconstructed auricle to elevate the new auricle and form the new sulcus. To provide a blood supply to the new cartilage and the new skin, a vascularized flap is prepared. In the past 11 years, we have used the following 3 different techniques of sulcus construction in microtia repair at Prosper Hospital, Recklinghausen, Germany: (1) a temporoparietal fascial flap (TPF), described in 1993 by Nagata1 in which an incision is made in the hair-bearing skin to prepare a vascularized flap based on the superficial temporal artery to supply the cartilage of the auricular buttress and the full-thickness skin graft; (2) a retroauricular fascial flap (RFF) from the mastoid region, described in 1999 by Yoshimura et al3 and in 2001 by Ou et al4; and (3) a superficial muscular aponeurotic system (SMAS) advancement flap, comprising local skin flaps from the mastoid or occipital region as described in 2009 by Magritz and Siegert5 (Figure 1).

The third stage is optional. In this stage, fine adjustments of the excess skin, deepening of the concha, and possibly epithelialization of the new external ear canal are performed.

The objectives of our study were to compare the auricular projection results across the 3 different techniques of sulcus construction in the second stage of primary microtia repair. We compared the use of a TPF, an RFF from the mastoid region, and an SMAS advancement flap.

METHODS

All the patients were photographed at least 3 months after the second stage (construction of the retroauricular sulcus) in auricular reconstruction for microtia. Patients with hemifac-
cial microsomia, patients missing anterior photographs, and patients without good photographs (ie, not symmetric or the auricle hidden by hair) were excluded.

We defined the outer edge of the ear, the medial edge of the ear, and the interpupillary distance by a horizontal line between the pupils. The distance between the outer edge and the medial edge divided by the horizontal line was defined as the auricular projection (Figure 2).

Statistical analyses were performed using commercially available software (SPSS, version 17.0; SPSS Inc). A t test for equality of means was used to compare the auricular projection results across the 3 different techniques of sulcus construction in microtia repair. We standardized for eye distance by resizing the photographs according to an element of known size in each photograph.

RESULTS

During the period analyzed between January 1994 and December 2010, a total of 443 patients were operated on for auricular reconstruction in microtia repair. Three different techniques of sulcus construction in microtia repair were used (a TPF, an RFF from the mastoid region, or an SMAS advancement flap).

Sixty patients (14%) had photographs suitable for measurements. Three of them (5%) had bilateral microtia and were operated on bilaterally; 34 patients (57%) had right-sided microtia, and 23 patients (38%) had left-sided microtia. Forty-five were lobule-type microtia, and 15 were concha-type microtia.

Thirty-three patients (55%) were male, and 27 patients (45%) were female. The mean age of the patients was 15.5 years; the youngest patient was 9 years old, and the oldest patient was 35 years old. Thirty-nine patients (65%) were younger than 16 years.

Forty surgical procedures used the SMAS advancement flap technique, 16 used the TPF technique, and 7 used the RFF technique from the mastoid region. Comparing the means for each technique, no statistically significant differences in the auricular projection results were observed among patients operated on using the 3 techniques. Using a t test for equality of means, the t statistics were 0.50 for the SMAS vs the RFF and 0.44 for the SMAS vs the TPF (mean [SD] 2-tailed \( P = .62 \) [\( P = .01 \) for both]). When we converted the auricular projection dimensions to millimeters, the difference across the reconstructed auricles was less than 1 mm. The mean (SD) values were 13.78 (0.22) mm for the SMAS, 14.33 (0.23) mm for the TPF, and 14.69 (0.24) mm for the RFF.

COMMENT

Many techniques have been described for sulcus construction in microtia repair. The TPF is a good vascularized and safe flap\(^1\,^6\,^9\), however, it requires more time to perform than the other 2 techniques described herein, and revision surgery is not an option with the TPF. Secondary defects are almost always inevitable when the TPF...
is performed using the conventional technique (Figure 3). The use of an endoscopic approach to elevate the TPF is a possibility, but it requires more time to perform.

The RFF from the mastoid region is a good alternative for microtia repair: it is a simple and well-vascularized flap (Figure 4). However, an RFF is unsuitable for the combination of auricular and middle ear reconstruction because the blood supply for the flap is based anteriorly, where the drilling for the new external ear canal needs to be performed.

The SMAS advancement flap is safe and easy to perform and results in no increased secondary defects. Moreover, the SMAS can be used for combined auricle and middle ear reconstructions. With the SMAS advancement flap, the TPF will be available for complicated or revision cases. It is important for surgeons performing microtia repair to be familiar with the various techniques for application in individual cases.

No statistically significant differences were observed in the projection of the reconstructed auricle among patients operated on using the 3 techniques. When we converted the auricular projection dimensions to millimeters by resizing the results according to a known reference object in the photograph, the difference across the reconstructed auricles was less than 1 mm.

Although the aesthetically accepted auricular projection is slightly less than 2 cm,10,11 we prefer to achieve a smaller projection. The new auricle is crafted similar to the other side so that it will not draw attention.

In conclusion, for the second stage (construction of the retroauricular sulcus) of auricular reconstruction for microtia, the SMAS advancement flap is suitable for patients requiring middle ear and auricle reconstruction. The performance of this flap is easier, quicker, less expensive, and associated with fewer perioperative complications compared with the other 2 techniques described herein.
Accepted for Publication: June 13, 2012. Published Online: October 22, 2012. doi:10.1001/2013.jamafacial.7

Correspondence: Shay I. Duvdevani, MD, Department of Otorhinolaryngology—Head and Neck Surgery, Chaim Sheba Medical Center, Tel Hashomer, 52621 Israel (shay.duvdevani@gmail.com).

Author Contributions: Study concept and design: Duvdevani, Magritz, and Siegert. Acquisition of data: Duvdevani, Magritz, and Siegert. Analysis and interpretation of data: Duvdevani, Magritz, and Siegert. Drafting of the manuscript: Duvdevani and Magritz. Critical revision of the manuscript for important intellectual content: Magritz and Siegert. Statistical analysis: Duvdevani and Magritz. Administrative, technical, and material support: Magritz and Siegert. Study supervision: Magritz and Siegert.

Conflict of Interest Disclosures: None reported.

REFERENCES


