

Pediatric Facial Plastic and Reconstructive Surgery

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Chapter 7: Congenital Auricular Abnormalities and Reconstruction

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Each plastic surgeon's skills are tested significantly when used to correct a congenitally malformed auricle. Although numerous publications have dealt with *microtia* by defining the condition's many grades, this chapter will concentrate on categories that frequently respond well to surgical reconstruction.

History and Classification

In 1959, Tanzer published the first article about using autogenous rib cartilage in auricular reconstruction for congenital microtia. Seven years later, Cronin began applying silastic as an implant material to correct the condition. Today, the world's foremost authority on auricular reconstruction is Brent, who began recording his work in 1974.

This chapter will classify microtia with a scheme described by Marx in 1926 and amended by Aguilar and Jahrsdoerfer in 1988. It divides microtia into three major grades. Grade I is a normal ear. In grade II, some of the auricular framework is present, but there are obvious deformities. Grade III describes the standard "peanut ear", which covers *anotia* - Marx's grade IV.

A clinical classification of auricular defects set forth by Tanzer in 1977 consists of five categories. These groups include:

1. anotia
2. complete hypoplasia (microtia):
 - with atresia of the external auditory canal
 - without atresia of the external auditory canal
3. hypoplasia of the middle third of the auricle
4. hypoplasia of the superior third of the auricle
 - constricted ear (cup and lop)
 - cryptotia
 - hypoplasia of entire superior third
5. prominent ear.

Eleven years before Tanzer developed his classified description Rogers published a similar delineation that divided auricular defects into (a) macrotia, (b) lop ear, (c) cup ear, and (d) prominent ear. In 1988, Weerda compiled all these classifications into a concise document, presenting definitions that were proposed by Marx and Tanzer and revised by Rogers.

Weerda's system included surgical guidance for each stage. Aguilar summarized these in his review.

First-Degree Dysplasia

In this first level, most structures of a normal auricle are present. Only minor deformities exist. Normally, reconstruction does not require additional skin or cartilage. Conditions include

- macrotia and protruding ears (prominent ears, bat ears)
- cryptotia (pocket ear, group IV B (Tanzer))
- absence of the upper helix
- small deformities (absence of the tragus, satyr ear, Darwin's tubercle, additional folds (Stahl's ear))
- colobomata (clefts, transverse coloboma)
- lobule deformities (pixed lobule, macrolobule, absence of the lobule, lobule colobomata (bifid lobule)).

Weerda's classification separates *cup ear deformities* into three classes, two of which are addressed under this category:

Type I demonstrates a cupped upper portion of the helix, hypertrophic concha, and reduced height. Its synonyms include lidding helix, constricted helix, group IV A (Tanzer), lop ear, and minor (mild or moderate) cupping.

Type II involves more severe lopping of the ear's upper pole. Here, rib cartilage is used as support when a short ear must be expanded, or the auricular cartilage is limp.

Second-Degree Dysplasia

Under this definition, only some normal auricular structures are recognizable. This stage is also called second-degree microtia (Marx). Additional skin and cartilage are employed to accomplish necessary partial reconstruction. *Mini-ear* falls under this category, as well.

Second-degree dysplasia describes Weerda's type III cup ear deformity as a condition in which the auricle is entirely malformed. Its synonyms are cochleshell ear, constricted helix, group IV (Tanzer), and snail shell ear.

Third-Degree Dysplasia

No normal auricular structures are present in third-degree dysplasia, requiring total reconstruction with skin and large quantities of cartilage. Its synonyms include complete hypoplasia group II, peanut ear, and third-degree microtia (Marx). Concomitant congenital atresia normally occurs in this phase.

Unilateral

In this circumstance, one ear is normal, and no middle ear reconstruction is performed on any child. Usually, auricle reconstruction does not become an alternative until a child reaches the age of 5 or 6.

Bilateral

Under this condition, a child is eligible for a bone-conducted hearing aid before his or her first birthday, middle ear surgery without transposition of the vestige at age 4, and bilateral auricle reconstruction at 5 or 6.

It is important to realize that the following recommendations are not absolute, and many unilateral cases have benefited from restoration of directional sound via atresia repair. For bilateral microtia, a bone-conducted hearing aid can be placed at birth. Also, even in bilateral cases, middle ear surgery can follow the first two stages of auricular reconstruction instead of being the first procedure.

Physician and Patient Information

When concomitant atresia is present in the treatment of congenital microtia, complete coordination between otologist and plastic surgeon is a must. The components of evaluation that should guide that coordination include

- the patient's age
- the grade of deformity
- the size of rib cartilages
- the presence of atresia
- the otological analysis
- photographs.

The management and treatment of microtia is accomplished in five stages:

Stage I - auricular reconstruction via the creation of a cartilaginous network derived from autogenous rib cartilage.

Stage II - lobule transposition.

Stage III - atresia repair by the otologist.

Stage IV - tragal construction.

Stage V - auricular elevation.

In this approach to treatment, the plastic surgeon's work should be done first, performing the procedure in a way that most efficiently reconstructs the microtia atresia complex.

Optimally, microtia correction should begin when the patient is 6 years old, especially in unilateral cases. At 6, the patient not only has sufficient cartilage to permit surgical reconstruction, but also is mature enough to manage the necessary postoperative care. Although bilateral microtia and atresia cases can be performed when the patient is younger than 6, the operation *should not* occur if insufficient cartilage exists to form a new ear.

Historically, material sources other than cartilage have proven failures. Neither irradiated cartilage nor silastic have been stable. Irradiate cartilage reabsorbs, whereas silastic tends to extrude over time. Furthermore, silastic implants are notorious for their inability to withstand trauma.

Diagnost Tests and Preoperative Preparation

Photographs of the patient are an integral element of preoperative planning, but the most important component is the proper preparation of the template. In unilateral cases, the template is based on the patient's contralateral ear. In bilateral cases, the mother's ear serves as the model. Measurement of the cartilage framework and its placement on the side of the head should be exact.

Radiologic examination should precede surgery, as well as a high-resolution computed tomography (CT) scan of the temporal bones. Although a CT scan is not necessary for microtia, it provides the plastic surgeon and otologist with information they can use to describe the entire reconstruction process to the patient's family before any surgical procedures occur.

Surgical Reconstruction: Congenital Microtia, Grade III

Stage I

The figures show auricular reconstruction undertaken during Stage I. Note that cartilage dissection is extraperichondrial, and there is no stripping of perichondrium at any point during the rib harvesting. The eighth rib is anchored to the sixth and seventh complex by stainless 5-0 wire, a technique popularized by Brent. When performed by trained surgeons, it produces very reliable results.

Stage II

The figures show lobule transposition that occurs in Stage II. An incision high on the back of the ear avoids protrusion of the lobule. The inferiorly based pedicle flap is very thin, so it should be handled with great care.

Stage III

It is after the first two procedures have been completed that the otologist performs atresia repair. Maintaining this sequence is important because the temporal bone remnant is in only one location, so the opening to the remnant can be made in only one place on the overlying skin. This makes it simple to line up the framework where the otologist has drilled the canal.

Complication rates increase substantially if the otologist drill the canal first, and it makes placing a cartilage framework around an external canal more difficult. In addition, the possibility of compromised blood flow and increased scarring make complications more difficult to avoid. The figures demonstrate the creation of the ear canal within the cartilage framework.

Stage IV

The tragal reconstruction is a delicate operation that requires ample presurgical planning.

As shown in the figures, a composite cartilage graft is normally acquired from the contralateral ear and placed in the proper location for the new tragus. A J-type incision is used to create a pocket for the new cartilage. The composite graft is then rotated 45° to face forward, covered by the anterior auricular skin.

Stage V

The figures show auricular elevation, and the reconstructed ear is shown. Elevating the auricle is the most dramatic stage of this procedure, because it brings the ear out from the side of the head, allowing it to assume a more natural appearance.

The split-thickness skin graft placed in the back of the ear should be reasonably thin to provide sufficient coverage and not expose the underlying cartilage, while still allowing proper soft tissue to nourish the skin graft.

The most important postoperative objective is to prevent the auricle from retracting significantly to the side of the head by encouraging the patient to move the ear forward and to continue flexing the auricular cartilage. A polyform splint may be fabricated to prevent retraction during the healing phase.

Grade II Reconstruction

Grade II auricular deformities involve those lesions that are not covered by descriptions of the "peanut ear" or those associated with Tanzer's grade IV. Therefore, reconstruction of grade II deformities first requires proper identification of the auricular imperfections. Is a part of the helix missing? To what degree? Is there a portion of the scapha missing? Are the lobule and tragus present? Does the conchal bowl exist?

"Lop ear" is a common description of any auricular abnormality that features a downward overgrowth of the helical rim. Insufficient scapha formation or the absence of the ear's antihelical bend can cause this irregularity. For this condition, I favor the Bard Cosman technique shown in the figures.

A Stahl ear deformity is just an extra fold, usually occurring in a posterior direction off the fossa triangularis. Treatment consists of removing the offending cartilage.

Correcting a lobule deficiency requires knowledge of the lobule's ability to reform. If one considers a Gavello flap technique an appropriate method, then the excess cartilage can be acquired from the contralateral ear and placed in the area along the lobule.

Perhaps the most common grade II operation is the correction of preauricular pits. It requires minimal plastic surgery experience. A direct excision is necessary, as well as following any anterior or posterior tracks. These procedures should be done before the patient's exposure to infection increases or a sebaceous cyst develops.

Complications

During surgical reconstruction, complications are possible, including

- skin necrosis overlying cartilage framework
- chondritis
- reabsorption
- malpositioning of the auricular implant
- tissue breakdown of the skin graft or of the ear's posterior aspect
- keloiding of the donor incision site or of the skin graft areas.

Placement of the cartilage graft severely strains overlying skin, allowing the potential for skin necrosis. Also, infection of cartilage can produce reabsorption, and the framework can be positioned improperly. Grafting procedures always possess the capacity for graft loss. The possibility of keloid formation increases when the skin graft is harvested from the abdomen or the buttock area.

These procedures can produce emergencies, too. They include

- Stage I - pleural tear, pneumothorax, pneumomediastinum
- Stage II - lobule necrosis
- Stage IV and V - chondritis.

Conclusion

There are two primary demands with which plastic surgeons should comply to provide appropriate care for patients who need surgical correction of congenital microtia. First, surgeons must sharpen these skills and keep them honed. Second, surgeons must practice the team approach with otologists as detailed in this chapter. Failure to offer this tandem approach to treatment results in a significant disservice to patients and their families. Combining the advantages of these disciplines invariably generates a level of care far superior to that created by independent work.