

Novel Approaches to Two-Stage Autogenous Auricular Reconstruction: Surgical Pearls for Congenital Microtia

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Background

Microtia is a congenital disease that affects 0.80 to 4.53 infants per 10,000 births. Although rare, malformed or absent external ears can have profound effects on hearing ability and mental health. One of the primary treatments for microtia is auricular reconstruction using autologous costal cartilage framework inset at the first stage and fascial flaps, wedge cartilage grafts, and skin grafts at the second stage.



Fig 1: Pre-operative photo of a 13-year-old girl with small-concha type microtia

Research Objectives/Methods

We present modifications to the conceptual classifications and surgical approach to auricular reconstruction with a focus on small concha-type microtia. After years of independent practice, the senior author has developed several frameworks and advanced novel techniques that appreciate the subtle anatomical challenges that small-concha type microtia presents.

Existing Classification Systems

Marx/Meurman Grading	Description
Grade 1	All identifiable landmarks are present with varying hypoplasia of the auricle
Grade II	Some identifiable landmarks present with varying hypoplasia of the concha and absent external auditory canal
Grade III	Only small lobule/auricular tag is present
Grade IV	Anotia

Nagata Class	Description
Lobule type	Those with the remnant ear and ear lobule but without the concha, acoustic meatus, and tragus
Conchal type	Those with the lobule, concha, tragus, and intertragal notch, presence of the acoustic meatus and upper pole of the auricle is variable
Small concha type	Characteristics of lobule type with an additional indentation representing the concha
Anotia	No external auricle

Surgical Pearls

- 1. Small-concha type microtia definition:** Nagata describes small-concha type microtia as possessing an indentation in the conchal bowl region, but the indentation may also be a cavity.
- 2. Auricular rectangle:** The proper location of the ear can be determined through the "auricular rectangle," a term coined by the senior author that utilizes multiple topographic references of the unaffected side in unilateral microtia: top of upper helix, caudal end of lobule, Frankfurt Horizontal line, shape of hairline, and face mask. Ear-positioning templates can also help locate the rectangle just outside of the face mask. Identifying the proper location of the ear is crucial to gauge if the vestige is in a surgically usable location and determines how Pearl #3 and #4 should be approached

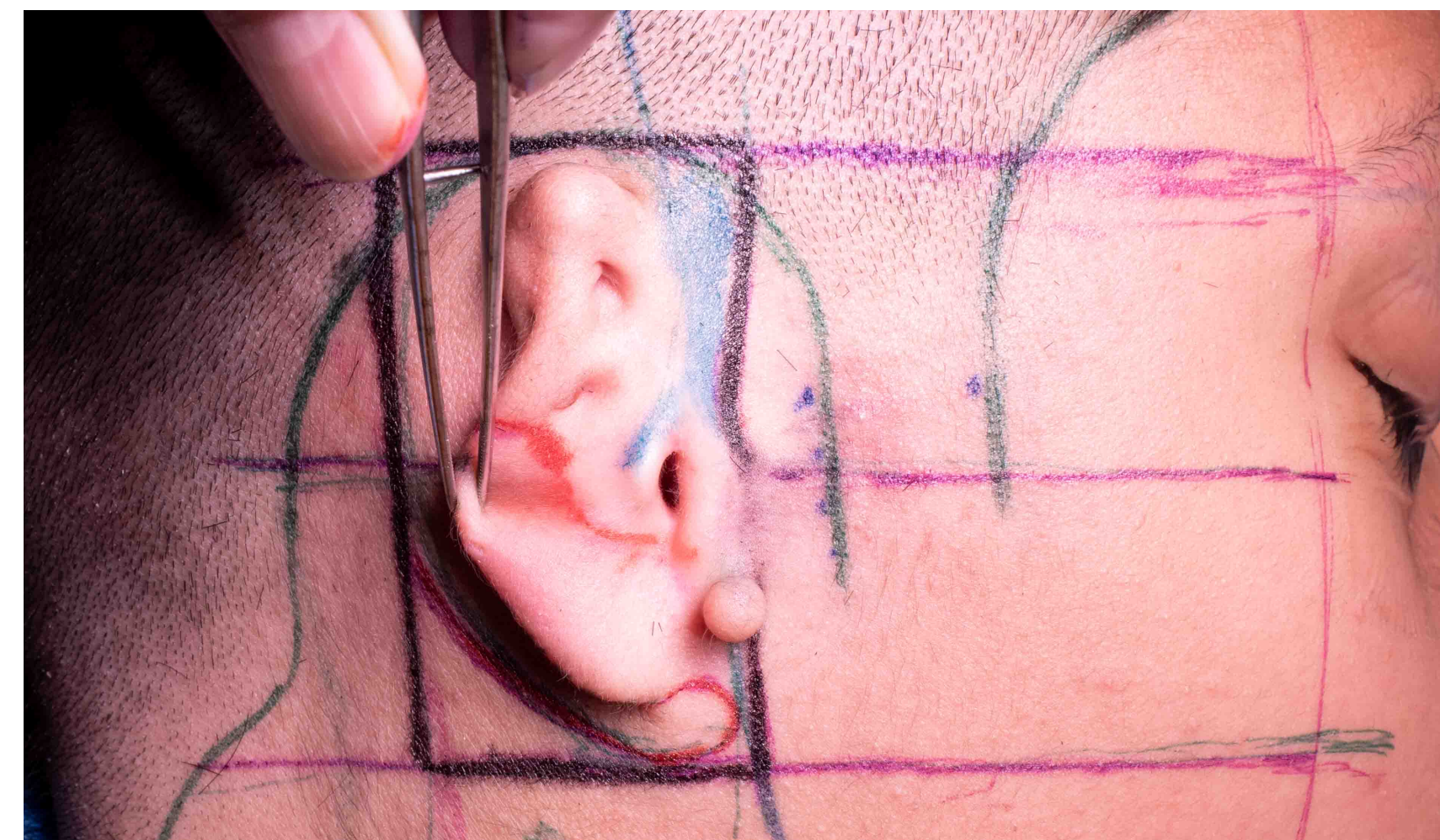


Fig 2: A photo of the cavity of the small concha, located anteriorly to the normal concha. The black box depicts the "auricular rectangle" where the new auricular construct will be placed. The upper purple line represents the top of upper helix, the middle purple line represents the Frankfurt horizontal, and the lowest purple line represents the caudal end of the lobule on the unaffected side.

- 3. W-flap design:** Nagata's 4-part report on modifications of the stages in total auricular reconstruction included the transition from a V- to W-shaped flap to maximize skin surface area to create deep concha. Unlike the symmetric W-flap in Nagata's figures, the senior author shapes the flap asymmetrically to provide sufficient anterior advancement to create the desired 10-15 degree posterior inclination of the affected ear. If the vestige does not need to be lowered, the flap is more U-shaped.

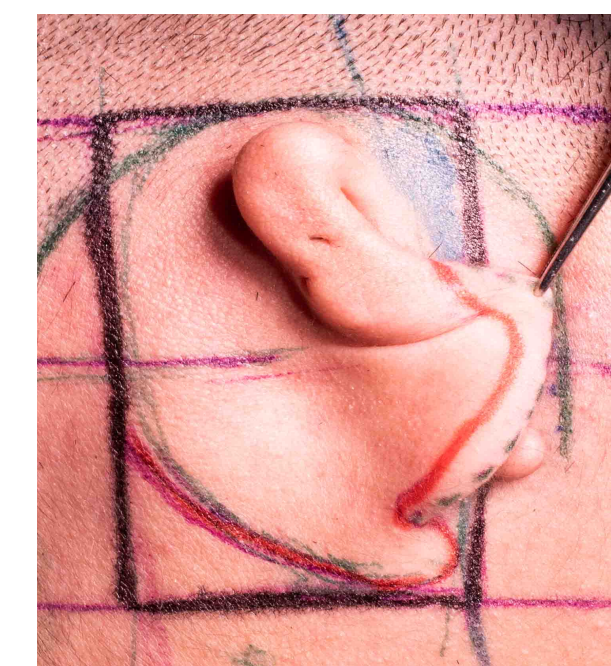


Fig 3: The red line represents "asymmetrical" W-flap that creates posterior inclination of the ear construct.

- 4. Indent of small concha:** The hallmark small indentation of small concha-type microtia is not in the correct anatomic location of the actual concha, so the skin flap elevated off the indent is too anteriorly positioned to be used for the tragus as Nagata and others suggest.

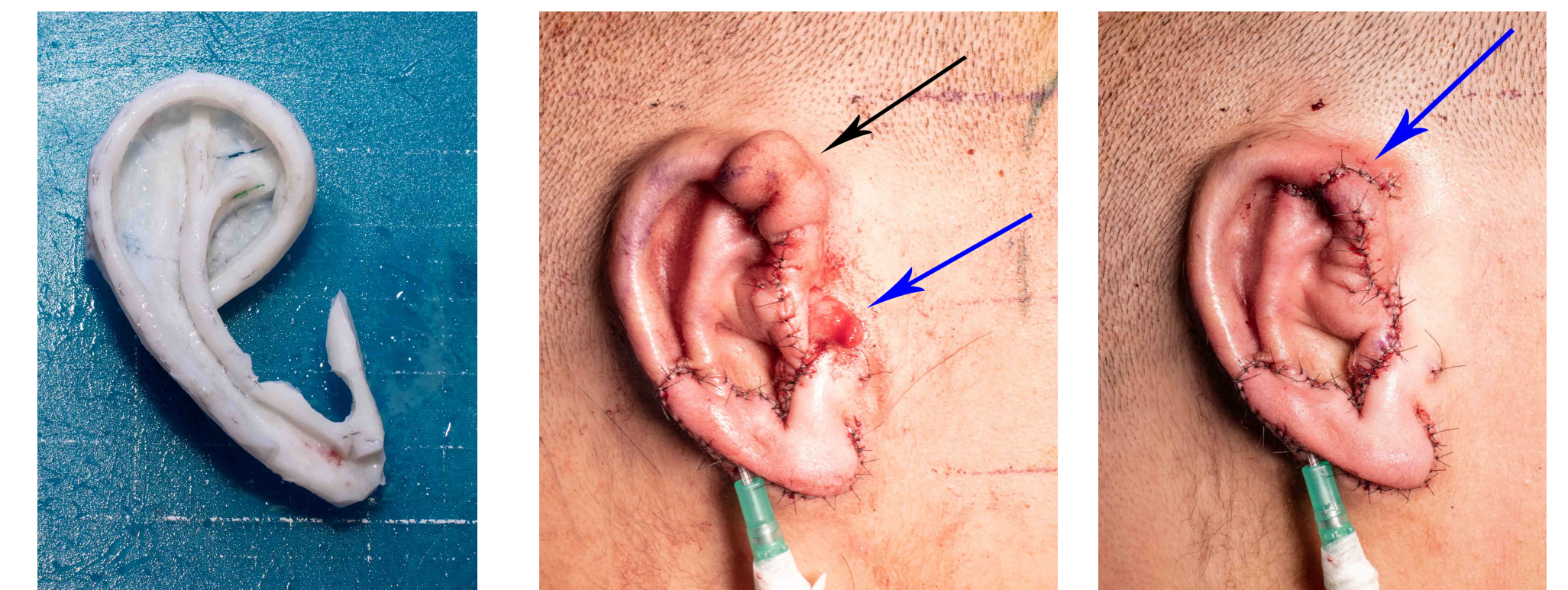


Fig 4: (Left) Framework carved from autologous rib cartilage. (Middle) An intra-operative photo of the auricular construct. The blue arrow points at the inverted small concha cavity prior to excision (note: the normal location of concha is located 1 cm posterior to small concha cavity). The black arrow points at the redundant skin prior to trimming. (Right) A photo of the auricular construct after the redundant skin trimming at the upper helix, the most typical site. The blue arrow points at the "safe" horizontal orientation of skin trimming.

- 5. Skin trimming:** After vestigial cartilage is removed and the cartilage framework is inserted around the subcutaneous pedicle of W-flap, the anterior lobule flap and transposed W-flap are closed. Suction is applied to adhere the skin envelope to the framework. The final location and posterior inclination of the ear is determined, which reveals the areas of redundant skin. Nagata did not describe the need to trim excess skin, but he performed it despite conventional teaching against it. Some literature reports not trimming the remnant hillocks after experiencing repeated necrosis secondary to the subcutaneous pedicle. The senior author finds that horizontal wound closure has been successful in providing uninterrupted blood supply while preventing ischemia.



Fig 5: Photo 2 years post-operation