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Microtia Reconstruction

Vito C. Quatela, MD[a,b,*], Scott K. Thompson, MD[a,b], Neal D. Goldman, MD[c]

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Microtia occurs in approximately 1 in 10,000 live births with an apparent higher incidence at altitudes above 2000 meters and in Hispanic and Asian populations [1,2]. The right ear is more commonly affected than the left, and boys more often are affected than girls at roughly a 2.5:1 ratio. Unilateral cases outnumber bilateral by a 4:1 ratio. Microtia results from abnormal embryologic development of any or all of the six auricular hillocks during weeks 4 to 12 of gestational development and is often associated with other congenital abnormalities. The cause remains unknown, although teratogens such as isotretinoin and thalidomide have been known to produce forms of microtia [3].

The degree of deformity can vary widely, but the most commonly accepted classification scheme divides microtia deformities into three types [3]. First-degree dysplasia refers to ears with mild deformities amenable to repair without the use of additional tissue. This would include defects such as lobule deformities and protruding ears. Second-degree dysplasia includes ears that have all major structures present to some degree but that have an absolute deficiency of tissue. Repair in these cases requires the addition of cartilage and skin. Third-degree dysplasia (classic microtia) requires total reconstruction due to the lack of recognizable landmarks of the auricle and canal.

Although various methods of reconstruction have been advocated over the years, autologous rib cartilage reconstruction, as established and modified by Tanzer and Brent, produces favorable results, few complications, and withstands trauma more consistently than any other reconstructive option [4–9]. Furthermore, when given the option, patients prefer a reconstructive option over a prosthesis [10]. The idea of creating a prefabricated cartilaginous ear framework by using cultured chondrocytes continues to be an area of interest and active research, but various challenges remain to be

[a] The Lindsay House Center for Cosmetic and Reconstructive Surgery, 973 East Avenue, Suite 100, Rochester, NY 14607, USA
[b] Department of Otolaryngology–Head and Neck Surgery, University of Rochester School of Medicine and Dentistry, 601 Elmwood Avenue, Box 629 Rochester, NY 14642, USA
[c] Department of Otolaryngology, Facial Plastic Surgery, Wake Forest University Baptist Medical Center, 131 Miller Street, Winston Salem, NC 27157, USA
* Corresponding author. The Lindsay House Center for Cosmetic and Reconstructive Surgery, 973 East Avenue, Suite 100, Rochester, NY 14607.
E-mail address: vquatela@quatela.com (V.C. Quatela).

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overcome before this can be used as a viable technique of reconstruction [9].

Architecture

To proceed with reconstruction, an understanding of the structural characteristics of the ear is essential. The architecture of the auricle can be broken down into integral structural elements [11]. The first defining component is the overall outline—an oval shape with a slightly flattened area posteroinferiorly. The next defining characteristic is a line that defines the helical rim from its root and the important crus helicus. Adding a third line defines the concha, including the tragus and antitragus. Further definition is added by highlighting the fossa triangularis [Fig. 1]. Understanding these structural elements allows the reconstructive surgeon to break down a complex three-dimensional configuration into basic components.

The actual dimensions and positioning of the reconstructed ear will define the outcome of the reconstruction. Exacting measurements must be made because visual examination alone can be misleading. The reconstruction should be symmetric with the contralateral ear. Perfect symmetry of its convolutions is not as crucial as vertical position and size. As the ears are on opposite sides of the head, only one ear can be viewed from the lateral aspect at a time. When viewed from the anterior, only the relative vertical position, length, and protrusion of the ears can be compared.

The length (highest point or supra-aurale to lowest point or subaurale) may vary significantly from patient to patient due to variations in the shape of the patient's face and variations in lobule characteristics. The average ear lengths are reported at 55 to 65 mm with a mean of 62.4 mm in males and 58.4 mm in females. Width is 55% of the length

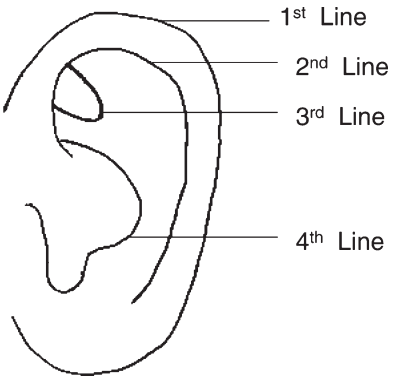

Fig. 1. Basic structure of a normal ear as defined by Tolleth. The reconstructive surgeon strives to recreate these components as closely as possible.

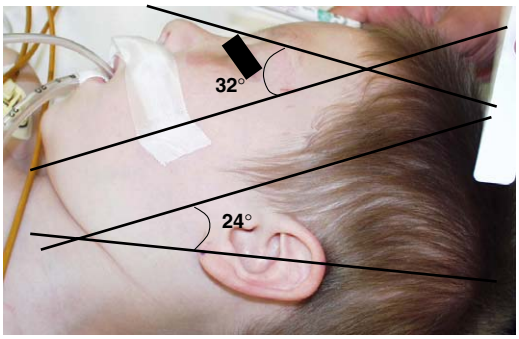

Fig. 2. As can be seen in this case, ear inclination should be slightly more vertical than the dorsum of the nose.

of the ear, achieving a mean of 35.5 mm in males and 33.4 mm in females [11,12]. The ear can be divided into three equal portions in the horizontal plane. The superior portion extends from the superior helical rim to the root of the helix at the upper border of the concha cymba. The midportion of the ear extends from the upper border of the concha cymba to the superior aspect of the antitragus. The lower third is composed of the lobule tip to the superior border of the antitragus [12]. The auriculocephalic angle or protrusion is documented at 15° to 20° in the normal population, as measured from the mastoid skin to the posterior surface of the auricle. This may vary from patient to patient but should be identical on the reconstructed and contralateral ears. Ear inclination is determined by measuring the angle made by the vertical axis of the face and the longitudinal axis of the ear with the patient in the Frankfort horizontal position and measures approximately 25° with a standard deviation of 6°. This angle averages approximately 30° for the nasal dorsum, thus making the ear slightly more vertical in orientation than the dorsum of the nose [Fig. 2] [11,13,14].

Proper positioning is crucial for satisfactory results. The superior extent of the auricle should be placed at the level of the lateral brow, parallel to the Frankfort plane. In patients with brow ptosis, the level of the upper lid is used [13]. The root of the helix is positioned approximately one ear length from the lateral brow. Measurements from the root of the helix to both the subnasale and the lateral canthus should be taken from the contralateral ear and used as a guideline for positioning. Facial asymmetries are found in up to 88% of patients with microtia. Asymmetries range from subtle differences in gnathion position to overt hemifacial microsomia due to abnormalities in branchial arch development [15]. This is important because measurements from the lower one-third of the face can be misleading.