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Otoplasty

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Learning Objectives: After studying this article, the participant should be able to: 1. Understand the anatomy of the prominent ear. 2. Correctly and precisely analyze the prominent ear deformity. 3. Establish and implement a surgical plan to treat the prominent ear based on the available techniques. 4. Recognize the potential complications of surgical correction of the prominent ear.

Background: Auricular deformities, specifically, prominent ears, are relatively frequent. Although the physiologic consequences are negligible, the aesthetic and psychological effects on the patient can be substantial.

Methods: Otoplasty techniques are used to correct many auricular deformities, including the prominent ear, the constricted ear, Stahl's deformity, and cryptotia. Various treatments and techniques have been developed for the correction of these deformities, including methods that excise, bend, suture, scratch, or reposition the auricular cartilage.

Results: The multitude of different approaches indicates that there is not one clearly definitive technique for correcting these problems.

Conclusions: This article reviews the history of otoplasty, its anatomical basis and a method for evaluation, techniques for the correction of the deformity, and potential complications of the procedure. (*Plast. Reconstr. Surg.* 115: 60e, 2005.)

Otoplasty techniques are used to correct many auricular deformities, including the prominent ear, the constricted ear, Stahl's deformity, and cryptotia, among others. Various treatments and techniques have been developed for the correction of these deformities, including methods that excise, bend, suture, scratch, or reposition the auricular cartilage. The multitude of different approaches indicates that there is not one clearly definitive technique with which to correct these problems. Although this discussion will center on the prominent ear and its correction, the fundamental principles can be applied to other auricular deformities as well.

Prominent ears are relatively common, with an incidence in whites of about 5 percent.[1] It is inherited as an autosomal dominant trait and is commonly caused by a combination of two defects: (1) underdevelopment of antihelical folding and (2) overdevelopment of the conchal wall.[1] Despite its benign physiologic consequences, numerous studies attest to the psychological distress, emotional trauma, and behavioral problems this deformity can inflict on children.[2–5]

Surgeons who treat this deformity must have a thorough understanding of the anatomy of the normal and prominent ear, be able to correctly and precisely analyze the deformity, and be able to establish and implement a surgical plan based on the available techniques. The purpose of this article is to give a broad overview of the anatomical basis for the prominent ear and to describe the various techniques used in its correction.

HISTORY

Dieffenbach (1845) is credited with the first otoplasty for the protruding ear (posttraumatic). He used postauricular skin excision

with conchomastoidal fixation.[6] Ely described his technique for elective correction of the prominent ear in 1881 using a postauricular skin excision, conchomastoidal fixation, and conchal strip excision. He performed this as a two-stage procedure (each side performed at a separate sitting).[7] After several efforts and revisions by Keen,[8] Monks,[9] Cocheril,[10] Morestin,[11] and Gersuny,[12] Luckett introduced the important concept of restoration of the antihelical fold.[13] Luckett corrected this deformity by using a cartilage-breaking technique consisting of skin and cartilage excision along the length of the antihelical fold combined with horizontal mattress sutures.

Becker, in 1952, introduced the concept of conical antihelical tubing using a combination of cartilage incisions and suture techniques in an effort to soften the contour of the corrected prominent ear.[14] This technique was later refined by Converse in 1955[15] and then Converse and Wood-Smith in 1963.[16] Mustardé's (1963) approach to the creation of antihelical tubing was to use permanent conchoscaphal mattress sutures.[17,18]

The work of Gibson and Davis (1958) on the ability of injured cartilage to warp away from the injured surface[19] led to the Chongchet (1963) and Stenstrom (1963) techniques. Chongchet's technique used sharp scoring of the lateral scaphal cartilage (with a scalpel) to form an antihelix.[20] Stenstrom, in contrast, used a rasp to blindly score the antihelix.[21]

Conchal reduction has been performed using various techniques. However, the use of conchomastoidal suturing was popularized by Furnas[22] and later modified by Spira et al.[23]

ANATOMY

The ear is a complex composite of cartilage and skin with many intricate involutions and folds (Fig. 1). It is composed of five critical elements—concha, helix, antihelix, tragus, and lobule—and parts of lesser importance, including the antitragus, intertragic notch, and Darwin's tubercle.[24] The anatomical divisions of the ear are based in embryology, with its origins based from the first (mandibular) and second (hyoid) branchial arches. The hyoid arch is the predominant contributor leading to the formation of the helix, scapha, antihelix, concha, antitragus, and lobule, whereas the mandibular arch only contributes to the tragus and helical crus.

The only difference between the neonatal ear and the adult ear is that, in the neonate, the cartilage is more malleable and soft. Otherwise, the anatomy is the same. The ear attains approximately 85 percent of its adult size by age 3 years.[3] Ear width reaches its mature size in boys at 7 years and in girls at 6 years. Ear length matures in boys at 13 years and in girls at 12.[25] The older the person becomes, the stiffer and more calcified the cartilage. This progression has an effect on the techniques
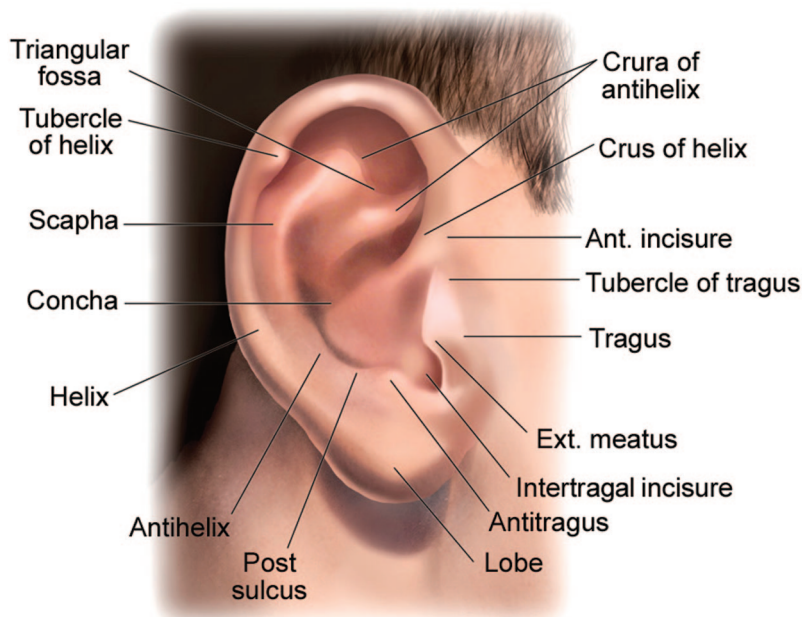

FIG. 1. Anatomy of the external ear.

TABLE I
Proportions of the Aesthetic Ear

The long axis of the ear inclines posteriorly at approximately a 20-degree angle from the vertical.

The ear axis does not normally parallel the bridge of the nose (the angle differential is approximately 15 degrees).

The ear is positioned at approximately one ear length (5.5–7 cm) posterior to the lateral orbital rim between horizontal planes that intersect the eyebrow and columella.

The width is approximately 50 to 60 percent of the length (width, 3–4.5 cm, length, 5.5–7 cm).

The anterolateral aspect of the helix protrudes at a 21 to 30-degree angle from the scalp.

The anterolateral aspect of the helix measures approximately 1.5 to 2 cm from the scalp (although there is a large amount of racial and gender variation).

The lobule and antihelical fold lie in a parallel plane at an acute angle to the mastoid process.

The helix should project 2 to 5 mm more laterally than the antihelix on frontal view.

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used to correct the prominent ear (cartilage molding versus cartilage breaking), which will be discussed later.

The normal ear has several proportions that are common in the normal, nonprominent, aesthetic ear (Table I).[24,26–33] The vascular supply to the external ear is from branches of the external carotid artery, namely, the posterior auricular and the superficial temporal arteries.

The innervation to the external ear follows its embryologic branchial arch origins. It consists of the anterior and posterior branches of the great auricular nerve, which innervates the first branchial arch structures (tragus and helical crus), and the auriculotemporal nerve, which innervates the second branchial arch structures (helix, scapha, antihelix, concha, antitragus, external acoustic meatus, and lobule). The external auditory meatus also receives innervation from branches of the vagus and glossopharyngeal nerves.

Anatomical Basis of the Prominent Ear

The main causes of the prominent ear are as follows (Fig. 2): (1) conchal hypertrophy or excess (upper pole, lower pole, or both); (2) inadequate formation of the antihelical fold (the root, superior crus, inferior crus, or all); (3) a conchoscaphal angle greater than 90 degrees; and (4) a combination of conchal hypertrophy and underdeveloped antihelical fold. Other causes can include cranial abnormalities (that influence the base on which the ear rests), lobular protrusion, and anterolateral displacement of the tail of the helix.[34] Occasionally, conchal excess can be difficult to appreciate. A well-described technique for these
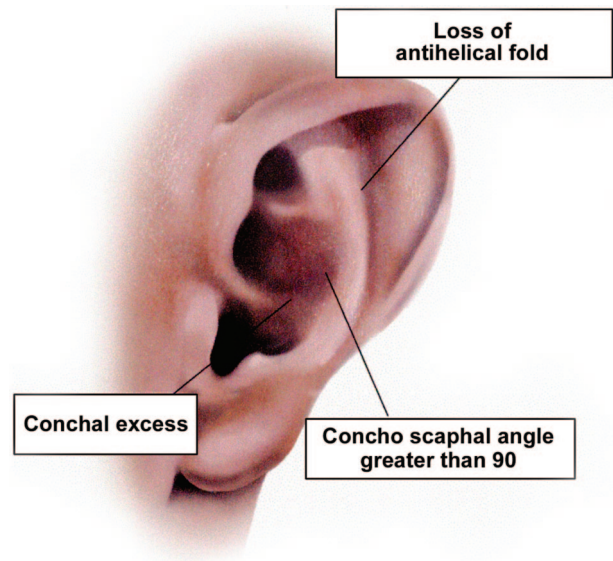

FIG. 2. Main causes of the prominent ear.

difficult cases is to apply medially directed pressure along the helical rim. This maneuver allows prominent conchal cartilage to be visualized.[35]

It is important to note that usually the prominent ear deformity is bilateral; however, Spira et al. point out that the cause of the defect may be different for each side.[23] Any procedure to correct a prominent ear should therefore address the underlying anatomical defect and attempt to correct it. Clearly, one approach will not work for all clinical presentations.

GOALS OF OTOPLASTY

The correction of prominent ears should keep in mind McDowell's basic goals of otoplasty[26]:

1. All upper third ear protrusion must be corrected.
2. The helix of both ears should be seen beyond the antihelix from the front view.
3. The helix should have a smooth and regular line throughout.
4. The postauricular sulcus should not be markedly decreased or distorted.
5. The helix to mastoid distance should fall in the normal range of 10 to 12 mm in the upper third, 16 to 18 mm in the middle third, and 20 to 22 mm in the lower third.
6. The position of the lateral ear border to the head should match within 3 mm at any point between the two ears.

LaTrenta suggests that three common anatomical goals must always be kept in mind: (1)

production of a smooth, rounded, and well-defined antihelical fold; (2) a conchoscaphal angle of 90 degrees; and (3) conchal reduction or reduction of the conchomastoidal angle.[35] Georgiade et al. add to this list the importance of lateral projection of the helical rim beyond the lobule.[36] In addition, any procedure should provide symmetrical and reproducible results and avoid unnecessary costs and complexity, scars, complications, and recurrence.

PATIENT EVALUATION

During preoperative evaluation, one should assess the following in the patient with prominent ears[37]: (1) degree of antihelical folding; (2) depth of the conchal bowl; (3) plane of the lobule and deformity, if present; (4) angle between the helical rim and the mastoid plane; and (5) quality and spring of the auricular cartilage.

The optimal timing of surgical correction of prominent ears depends on a rational approach based on auricular growth and age of school matriculation.[32] Because the ear is nearly fully developed by age 6 to 7 years, correction may be performed by this time. In 76 patients who underwent cartilage excision otoplasty for prominent ears, Balogh and Millesi demonstrated that auricular growth was not halted after a 7-year mean follow-up.[38]

NONSURGICAL CORRECTION

Nonsurgical correction of ear deformities, including prominent ears, usually has poor results. There is evidence, however, that intervention within the first few days of life may adequately treat a prominent ear. Excellent results were reported by Tan et al. when auricular molding was started within 3 days of birth and continued for up to 6 months.[39,40] Delay of treatment yielded poor results. Tan attributes the loss of cartilage pliability after birth to decreasing levels for circulating maternal estrogens, which are highest in the first 3 days after birth and decrease to normal levels by 6 weeks of age. Matsuo et al. also reported no recurrence after 6 months when the prominent ear was corrected with surgical tape within 3 days of birth.[41] However, results were poor when the taping was started after this period.

Matsuo et al. also observed that the percentage of protruding ears increases from 0.4 percent at birth to 5.5 percent at 1 year of age and concluded that most protruding ears are acquired deformities. They postulated that the mechanism is that when a baby is placed in a supine position, the weight of the baby's head will fold the ear forward when the baby turns its head to one side.[42] This mechanism has not been definitively proven; thus, behavioral modification techniques have not been a mainstay of nonsurgical treatment.

OPERATIVE PROCEDURES

Surgical techniques for the correction of the prominent ear can be grouped into maneuvers used to create the antihelical fold, to correct the conchal defect, and to affect lobule positioning.

Creation of the Antihelical Fold

Many techniques have been described to correct the antihelical fold. These can be subdivided into those that rely on cartilage scoring and those that use suture fixation. Of course, there are combinations of these techniques as well.

Scoring techniques can be further subdivided into those that just superficially score the cartilage and those that score deep enough to actually cut through the newly created antihelix. Furthermore, the scoring can be accomplished on either the anterior or the posterior surface of the cartilage. In general, however, full-thickness penetration of the cartilage usually results in a sharper antihelical fold, which is undesirable.[23,43]

Luckett's original procedure to create a new antihelical fold involved excising a crescentic segment of cartilage posteriorly and reapproximating the remaining edges to each other. However, this creates a sharp, unnatural-appearing fold. Modifications of this single-incision technique were created that used a pair of parallel incisions on either side of the antihelix. When the edges of this cartilage bridge are folded back, it forms a tube, which is subsequently sutured to form a smooth, rounded, more natural-appearing antihelix.[44]

Scoring techniques are based on the observations of Gibson and Davis that cartilage tends to warp away from an injured surface.[19] Fry later confirmed this observation and attributed it to "interlocked stresses" that were released by a perichondrial incision.[45] Stenstrom[21] and Chongchet[20] applied this theory to otoplasty. Stenstrom's initial technique consisted of anterior scaphal scoring to produce an antihelical fold. He later modified his technique with the addition of a posterior approach.[46] It is impor-

tant to note that the desired amount of cartilage warping can be adjusted by the extent of the scratching or scoring.

Various suturing techniques will also produce an antihelix. The Mustardé approach is used to create an antihelical fold for correcting the prominence of the upper third of the ear.[17] His technique involves mattress sutures placed in the posterior cartilage that incorporate the full thickness of the cartilage and anterior perichondrium (but not the anterior skin) (Fig. 3).

Kaye[47] and Tramier[48] advocate an anterior approach to placing the plication sutures. Proponents of this anterior approach believe it eliminates the need for extensive flap dissection, thereby minimizing postoperative discomfort and risk of infection and hematoma.

Pilz et al. prefer a modification of the technique originally described by Stark and Saunders, whereby a postauricular skin excision is combined with controlled dermabrasion of the posterior cartilage surface.[49] Scapha-mastoid sutures then create the desired amount of antihelical folding. Pilz et al.'s modification adds any combination of additional scapha-conchal, concha-mastoid, and/or helical sulcus-conchal sutures.[50]

Recreation of the curvilinear sweep of the antihelix is important to create a natural "unoperated appearing" ear. This fine point is addressed by Johnson,[51] who supports the use of Mustardé sutures placed in an oblique, rather than radial, fashion because he believes this

will better correct upper pole prominence and also prevent overfolding of the antihelix.

Correction of the Conchal Defect.

Conchal deformity can be addressed by several methods, including suturing techniques, excisional techniques, and scoring.

Conchal mastoid sutures can be used to correct conchal excess or prominence of the superior two thirds of the ear. This suture technique was originally described by Owens and Delgado (1955).[52] Their method was subsequently modified by Furnas,[22] who used nonabsorbable, full-thickness mattress sutures placed in the conchal cartilage (piercing the anterior perichondrium) and sutured it to the mastoid fascia (Fig. 4). This is performed before correction of any antihelix defect. He cautions that sutures placed too far forward on the mastoid or too far back on the concha will cause outward and forward rotation of the conchal cup, causing reduction of the external auditory canal diameter.

Spira and Stal modified this technique to include a laterally based conchal cartilage flap that is subsequently sutured to the mastoid periosteum.[53] This maneuver serves to bring the concha closer to the scalp and thus reduces protrusion. This particular technique offers the advantage of a thick cartilaginous flap that can be more permanently and precisely anchored to the periosteum while decreasing the tendency to obstruct the external auditory canal.

Excisional techniques can also be used to reduce conchal hypertrophy. These techniques can be grouped into those that excise cartilage alone and those that excise both skin and cartilage. The cartilage-only procedures are usually performed through a posterior approach, whereas the skin and cartilage techniques are usually performed through an anterior approach. There has been no proven advantage of an anterior versus a posterior approach. Instead, it is a matter of personal preference. A posterior approach to the conchal bowl is described by Beasley and Jones.[54] This technique stresses resection of the lower conchal bowl segment if the antitragus is prominent and thinning of the ponticulus where the postauricular muscle inserts. Elliott[43,55] and Bauer[50] both prefer an anterior approach because they believe that the extra skin remaining after a cartilage excision may not shrink down enough
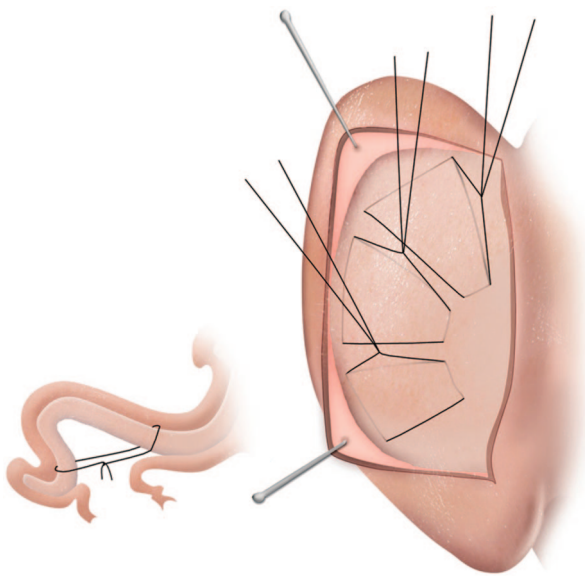

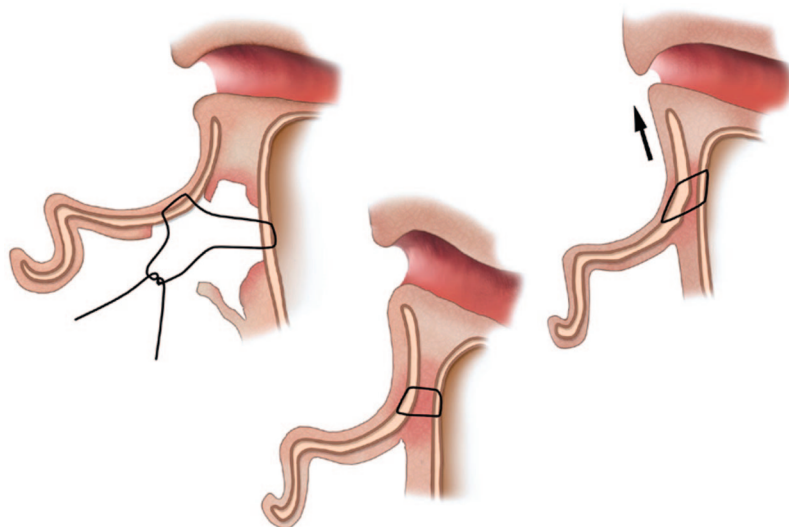Fig. 3. Mustardé mattress suture technique to create the antihelical fold.

FIG. 4. Conchal-mastoid sutures to correct conchal excess.

postoperatively to avoid leaving a visible fold in the conchal floor.

Finally, careful scoring may be used alone or in combination to reduce conchal prominence. Using the Gibson principle, the anterior surface of the concha can be scored so as to warp the conchal wall in a posterior direction. This essentially converts the prominent conchal wall into scaphal surface.

Lobule Positioning

Wood-Smith uses a modified fishtail correction to correct the prominent lobule (Fig. 5).[56] Spira et al.[23] treat the protruding lobule by wedge-excision and a deep dermis–to–scalp

FIG. 5. Modified fishtail technique to correct a prominent lobule.

periosteum suture. Another method involves a curvilinear, fusiform excision from the anterior to posterior lobe margin with a central V excision to effect easy closure.[1]

Combined Techniques

There have been countless descriptions by individual surgeons detailing their particular combination of the above techniques to effect reproducible results. Stal et al. (1997) published an algorithmic approach for otoplasty that uses many of the techniques in a logical, systematic, graduated fashion (Fig. 6).[57]

An ear with a deep concha but well-developed antihelical fold may only require a conchal resection, with the addition of a conchal setback if the conchal-cephalic angle is greater than 90 degrees. Commonly, a poorly developed antihelical fold will be present with or without a deep concha. In this case, Mustardé-type sutures should be used to create the fold. Anterior cartilage scratching should be used as an adjunct to help fold the cartilage. Superior pole overcorrection should be considered because this area is prone to recurrence

A prominent lobule not corrected by finger pressure on the helix rim will require one of the previously described additional procedures. Posterior scratching is contraindicated because it results in cartilage bending in the opposite rather than the desired direction. Likewise, through-and-through cartilage incisions should be avoided because of the resultant visible step-off deformity.[1]
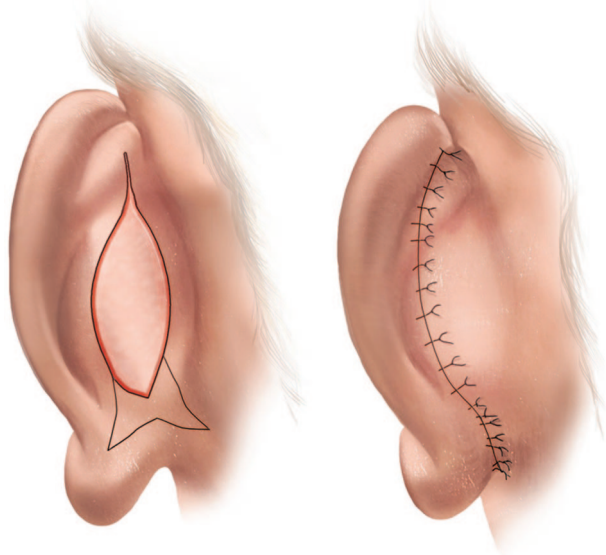
Otoplasty

Anatomic Abnormality

Macrotia Reduction Otoplasty (may need B & C)

C. Prominent Lobule after Setback

Eccentric Excision & Plication of Lobule Dermis to the Concha (Spira Stitch) → **STOP**

Excision of Posterior Lobule Skin & Fibro-Fatty Tissue Patterns:
- ellipse
- heart shaped
- v-shaped
- z-plasty

→ **STOP**

Protuberant Helical Tail → **Pexy Helical Tail to Concha (4-0 Mersilene) (Webster Tech.)** → **STOP**

A. Deep Concha with a Prominent Posterior Wall

Posterior Wall < 2.5 cm deep → **Concha-Mastoid Sutures (Furnas Tech.)*** → **Setback Achieved** → **Go to B**

Posterior Wall > 2.5 cm deep → **Excision of Post-Auricular Tissue to the Mastoid. Periosteum and Concha-Mastoid Sutures (Elliot Tech.)**
- → **Setback Achieved** → **Go to B**
- → **Residual Prominence**
  - (−) → **Posterior Approach Excision of Conchal Cartilage and Wide Skin Undermining** → **Go to B**
  - (+) → **Anterior Approach: Excision of Ant. Conchal Cartilage and Skin** → **Go to B**

Narrowed External Auditory Canal + **Posterior Concha-Swinging Door Flap (Spira Tech.)** → **Go to B**

B. Unfolded Antihelix Scaphoconchal Angle > 90° Height > 1.8 − 2.5 cm

<5 yrs old Soft Malleable Cartilage → **Mustardé Sutures 5-6 radially oriented sutures* (4-0 Mersilene)** → **Go to C**

>5 yrs old or Stiff Adult Cartilage → **Anterior Scoring with Dingman Otobrader*** → **Mustardé Sutures 4-5 radially oriented (4-0 Mersilene)*** → **Prominent Helical Root**
- (−) → **Go to C**
- (+) → **Hitch Stitch Pexy Helical Root to Temporalis Fascia** → **Go to C**

Radial placement of the Mustardé sutures helps avoid a "Post-ear" deformity

**The cartilage is rasped just until the spring is broken and the position is easily maintained with light digital pressure*

***Concha-mastoid sutures should be oriented in the strict anterior-posterior direction to reduce narrowing of the external auditory canal*
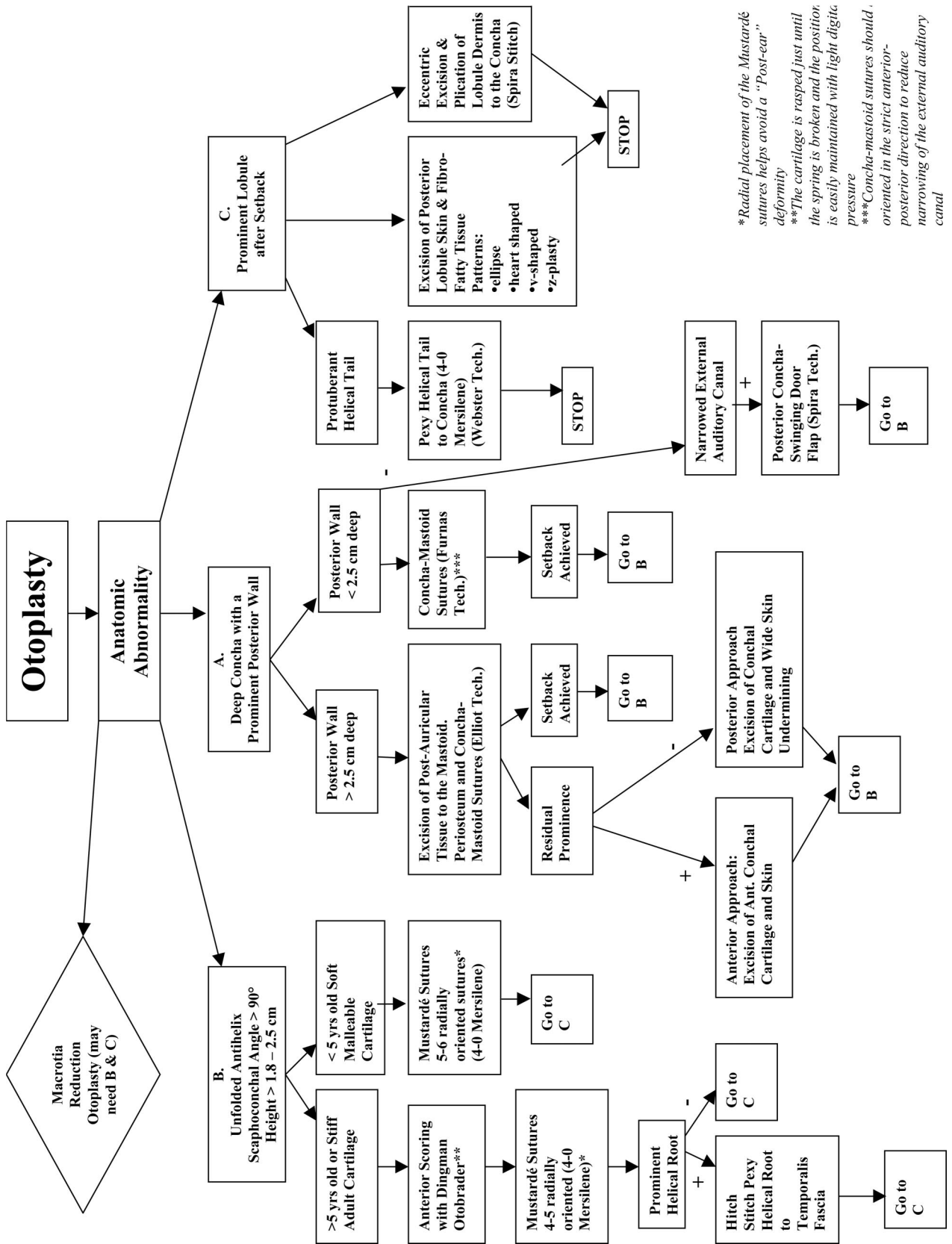
FIG. 6. An algorithmic approach to otoplasty. Reprinted with permission from Stal, S., Klebuc, M., and Spira, M. An algorithm for otoplasty. *Oper. Tech. Plast. Reconstr. Surg.* 4: 88, 1997.

Minimally Invasive Otoplasty

To minimize operative dissection, scarring, and postoperative discomfort, two recent reports advocate "incisionless" or "knifeless" otoplasty. Fritsch[58] describes his incisionless technique whereby he places percutaneous, permanent subcutaneous horizontal mattress sutures. He reported this in 13 patients and found one recurrence caused by suture failure at a 6-month mean follow-up. Peled's technique[59] involves a similar suture technique but includes anterior cartilage scoring as well. No recurrence was found at follow-up at 6 to 30 months in 20 ears. Although the long-term effects of this suture method are not known, Fritsch points out that cartilage may be permanently bent by external splints and suggests internal sutures may have the same effect. Thus, long-term suture failure may not be clinically significant.

Graham and Gault's endoscopic-assisted otoplasty[60] approaches the posterior aspect of the auricular cartilage through a port in the temporal scalp. The posterior cartilage is weakened by abrasion, and the antihelical fold is created and maintained by nonabsorbable scaphal-mastoid sutures placed by means of small postauricular stab incisions. By moving a large scar into the temporal scalp, an ear keloid or hypertrophic scar may be avoided. This endoscopic approach was used on 18 prominent ears, with good results and no recurrences. Although these minimally invasive techniques show promise, long-term follow-up and reproducible results are needed before they can be recommended as procedures of choice.

Outcomes and Complications

Elliott divided unsatisfactory results of otoplasty into early complications and late sequelae.[43] Early complications include hematoma, infection, chondritis, pain, bleeding, pruritus, and necrosis. Late sequelae include unsightly scarring, patient dissatisfaction, suture problems, and dysesthesias.

Early complications. Hematoma is one of the most dreaded immediate postoperative complications. It is heralded by the acute onset of severe, persistent, and often unilateral pain. If encountered, the head dressing should be removed and sutures released to drain the hematoma. If there is evidence of ongoing bleeding, reoperation and exploration are mandatory.

Infection is another potentially devastating complication of otoplasty, especially because it can lead to the development of chondritis and residual deformity. Infection can be caused by a break in proper sterile surgical technique or dehiscence secondary to excessive tension during closure, or it can be an untoward sequela of prior hematoma evacuation. If redness, swelling, and drainage are encountered, treatment with intravenous antibiotics is recommended, as is the use of topical mafenide acetate cream. The usual pathogens are *Staphylococcus, Streptococcus,* and sometimes *Pseudomonas.*

Chondritis is a surgical emergency. If left untreated, it can result in deformity. Therefore, prompt débridement of devitalized tissue is necessary.

Late sequelae. Residual deformity is, by far, the most common unsatisfactory result of otoplasty. It usually is apparent by 6 months postoperatively and is manifested by one or more of the following[61]: a sharply ridged antihelical fold; lack of normal curvature of the superior crus; irregular contouring; a malpositioned or poorly constructed antihelical roll; an excessively large scapha; and a narrow ear.

Most of the time, the residual deformity is a result of poor surgical planning and execution rather than an inherent technical problem. However, there are several studies, some with long-term follow-up, that illuminate several key differences in technique and potential drawbacks.

In a retrospective comparison of Mustardé's posterior suturing technique to Stenstrom's anterior scoring technique, Tan[62] found that although patient satisfaction with the aesthetic results were the same between the two approaches, ears treated by Mustardé's method required more than twice as many reoperations (24.4 percent versus 9.9 percent). Furthermore, Tan confirmed the complication of sinus formation and wound infections caused by the presence of sutures (15 percent incidence).

Mustardé himself has conducted two reviews of his own procedure. The first, in 1967, surveyed his results with 264 ears over a 10-year period.[18] Seventeen cases were judged as unsatisfactory with problems such as kinking within the antihelix, sutures cutting out, sinus formation, recurrence of prominence, and horizontal projection of the antitragus and lobule. He details the causes for each of these complications and includes guides on avoiding these pitfalls. A subsequent study in 1980 of 600 ears

FIG. 7. Preoperative views of a 13-year-old girl with a lack of antihelical fold definition, conchal bowl hypertrophy, and prominent lobules. (*Above, left*) Anteroposterior view; (*above, center*) oblique view; (*above, right*) lateral view; (*below*) posterior view.

over 20 years found a 0 percent incidence of stitch rejection, a 0.01 percent incidence of sinus tract formation, and a 0.02 percent incidence of reoperation.[63]

Spira and Hardy critically examined their experience with the Mustardé technique and did not find the same success rates. They determined that there were a large number of relatively minor complications and a high rate of partial recurrence of the original deformity.[64] In a comparative study, Hyckel et al. compared Mustardé's and Converse's methods and found no objective or subjective differences.[65]

Heftner[66] surveyed patient satisfaction with use of the Stenstrom technique and found that 89 percent were either very satisfied or satisfied. He also noted that in 81 percent of patients, the Stenstrom technique produced a round, natural antihelical fold, whereas only 14 percent had a sharp contour. Calder and Naasan reviewed their experience with 562 Stenstrom otoplasties and found a 16.6 percent overall complication rate with an 8 percent incidence of residual deformity (follow-up, 12 months). After analysis of these results, they concluded that the fault at the primary procedure was mostly that of design (73.4 percent), although many other residual problems were caused by poor execution of technique (26.6 percent).[67]

Adamson et al. retrospectively reviewed their experience with conchal setback and antihelical suture placement in 119 ears, with a median follow-up of 6 months.[68] They found that patients who had cartilage-cutting procedures tended to have higher revision rates and persistent postoperative stigmata compared with those who had cartilage-sparing procedures. Specifically, they also found that the superior pole became lateralized to approximately 40 percent of the original correction, although no significant loss of correction was noted in the middle and inferior areas of the ear. This led to revision in 6.5 percent of the ears. Adamson et al. recommend adding fossa triangularis–temporalis fascia sutures to correct this superior pole lateralization.

Loss of superior pole correction was also reported by Messner and Crysdale[69] in patients who underwent cartilage-sparing otoplasty using a combination of Mustardé's and Furnas' techniques, including placement of fossa triangularis–temporalis fascia sutures. The corrected ears returned to their preoperative position in one third of their cases, and one third of their cases had a final position between their preoperative and postoperative positions. Despite this loss of correction, 85 percent of patients were satisfied with their results. Messner and Crysdale noted that ears short in their vertical dimension (less than 50 mm) were much more likely to maintain their postoperative corrected positions. The larger the cartilage that was bent to create an antihelix, the more likely the ear was to lose its correction.

Persistent superior pole prominence was also noted by Georgiade et al.[36] They recommended additional superior helix scoring or higher posterior vertical mattress suture placement to resolve this problem. Webster recommends slight overcorrection of the superior pole to allow for postoperative changes.

The psychological and social outcomes of prominent ear correction were evaluated by Bradbury et al.,[4] who found improved well-being in 90 percent of the children 12 months postoperatively. However, just as preoperative distress could not be predicted from the degree of ear prominence, postoperative satisfaction could not be predicted from the quality of surgical correction. Bradbury et al. recommend psychological evaluation for any child showing evidence of marked social isolation or acute distress before any operation.

CASE REPORT

A 13-year-old otherwise healthy white girl presented with bilateral prominent ears. Physical examination revealed bilateral prominent ears, lack of helical fold definition (right greater than left), bilateral conchal hypertrophy (right greater than left), and prominent lobules (Fig. 7). The operative plan was as follows: general anesthesia; preoperative marking of the antihelix with methylene blue dye; posterior lenticular incision; excision of the auricularis; placement of three Mustardé sutures (superior, middle, and inferior) using 4-0 clear nylon (Fig. 8); placement of two (superior and inferior) conchomastoid sutures using 4-0 clear nylon; and

FIG. 8. Intraoperative view of the right ear. (*Left*) Before the Mustardé sutures were placed, the anticipated sites chosen to suture were marked with methylene blue dye. Note the lack of definition of the antihelical fold. (*Right*) After the Mustardé sutures were placed.

FIG. 9. Postoperative views at 6 months. (*Above, left*) Anteroposterior view; (*above, center*) oblique view; (*above, right*) lateral view; (*below*) posterior view.

placement of a single lobule-fascial suture (4-0 clear nylon) to bring back the prominent lobule.

At 6 months postoperatively, the patient demonstrated significant improvement in her antihelical fold definition. She had more properly proportioned ears without conchal bowl excess and less prominent lobules (Fig. 9). The patient was very satisfied with her outcome.

REVISION OTOPLASTY

Otoplasty procedures may result in new deformities that need to be corrected, including an obliterated postauricular sulcus, contour deformities of the antihelical fold, a telephone deformity, a protruding lobule, an obliterated external ear canal, and postperichondritis deformity. Approaches to these common problems have been described by Walter and Nolst Trenité.[70] An obliterated postauricular sulcus can be corrected by a posterior zigzag skin incision, approximation of the skin triangle points, and filling of remaining defects with full-thickness skin grafts. A prosthetic device is worn to prevent tissue retraction. Minor antihelix irregularities can be treated by curettage, and larger defects may be corrected by insertion of temporalis fascia, cartilage grafts, or prosthetic materials. An obliterated ear canal caused by improper conchal setback may be corrected by cartilage resection through a posterior approach. Revision for recurrence of ear prominence, especially at the superior pole, can be achieved by posterior cartilage thinning and anterior scoring if the cartilage is thick and stiff.

Replacement of the sutures should include broad chondral anchorage points.[71]

SUMMARY

Auricular deformities, specifically, prominent ears, are relatively frequent. Although the physiological consequences are negligible, the aesthetic and psychological effects on the patient can be substantial. This article reviewed the history of otoplasty, its anatomical basis and a method for evaluation, techniques for correction of the deformity, and potential complications of the procedure. Outcome studies show that, overall, patient satisfaction is extremely high, with a recurrence rate generally less than 10 percent. Accurate preoperative diagnosis of the specific components of the deformity, proper planning, and excellent technical execution of the procedure are paramount to obtaining a good, long-lasting, aesthetic result.

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