Paparella: Volume IV: Plastic and Reconstructive Surgery and Interrelated Disciplines

Section 1: Plastic and Reconstructive Surgery

Chapter 7: Otoplasty

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From a teleologic standpoint, the external ear provides little toward the fundamental physiology of hearing or protection of the middle ear. From an aesthetic vantage point, the auricle is usually inconspicuous unless unduly prominent or deformed, and therefore is often taken for granted. Nevertheless, from a purely artistic perspective the intricate convolutions and folds of the external ear are a sight of beauty. As stated by Tolleth, physicians have used the auricle as a harbinger of underlying pathology, psychologists as a clue to personality disorders, criminologists as a means of identification, and anthropologists as a means of racial differentiation.

In some cultures, such as Japan, a larger prominent ear is considered a sign of good fortune, but this is not the case in Western civilization. Only a remarkably stable personality could bear the psychological handicap of ridicule and ostracism among child age peers that may result from the stigma of a lop-ear deformity. While obvious deformity is easily recognizable, subtle aberrations may be unnoticed and quite acceptable. Asymmetries, even from side to side, are commonplace. Numerous auricular malformations have been described and the March of Dimes has classified five main groups: absent anthelix, auricle and earlobe hypertrophy, uncurled helix, hyperpneumatization of the mastoid bone, and hypertrophic concha. The two that predominate for purposes of this discussion are an overdeveloped, deep concha and underdeveloped or flattened anthelical fold. Both of these result in an increased angle between the pinna and the scalp.

The development of a lop-ear deformity is often hereditary and has been described as having a mendelian dominant transmission that affects 3 to 5 per cent of Western populations.

Embryology

The human auricle develops from six swellings known as auricular hillocks that appear during the sixth week of fetal life. These develop around the margins of the first branchial groove and are produced by a condensation of ectoderm and proliferation of mesenchyme from the first and second branchial arches. The anterior three hillocks originate from the first branchial or mandibular arch and the posterior three from the second branchial or hyoid arch. Some authors believe that hillocks 1, 2, and 3 form the tragus, crus helicis, and helix, respectively and that the remaining 85 per cent of the external ear is formed by the second branchial arch; others assign only the tragus to the first branchial arch. Initial development of the external ear is in the upper part of the future neck region, but as the mandible develops the ear moves from this anterior

caudal position to a more posterior cranial position and ascends to the level of the eyes. During the 8th to the 12th week of gestation, rapid development of the helix causes it to project forward and lie above the relatively underdeveloped anthelix. Protrusion of the ear is normal during this period, but if during the 12th to the 16th week the anthelix fails to unfold, the helix will continue to overhand and protrusion will persist; a lop-ear deformity will result.

Anatomy and Analysis of The Deformity

The auricle is a convoluted, intricately formed structure made up of fibroelastic cartilage. Lacking a subdermal connective tissue layer, the skin covering the ear on its lateral aspect is thin and closely adherent to the perichondrium. The skin covering the medial aspect of the ear is thicker, less adherent, and separated from the perichondrium by a connective tissue layer. This layer allows the skin to be readily stripped from the medial aspect of the ear.

Projecting superiorly from a crease that extends horizontally above the external auditory canal is the helical rim. The helix arcs over the superior aspect of the ear with a radius of approximately 2 cm and then continues inferiorly to merge with the cauda helicis and join the lobule of the ear. No part of the helical arch is flat. Occasionally a thickened portion of the helix is noted at the upper outer aspect and this is described as Darwin's tubercle. Unless unusually large, this tubercle is of little aesthetic significance.

The anthelix is an arced, V-shaped configuration and is the main structural component of the ear. Inferiorly, it is sharp edged and narrow. Superiorly, it ascends to form two crura: a superior crus, which is broad and flattened, and a short, tightly constricted inferior crus. A shallow fossa posterior to the superior crus is known as the scapha. The depression between the superior and inferior crus is known as the fossa triangularis. When the ear is viewed from the front, the helical rim lies slightly more lateral than does the anthelical fold.

The conchal cavity is a shallow, cuplike structure approximately 1.5 x 1.5 x 2.5 cm in depth, width, and height, respectively. The root of the helix divides the conchal cavity into a superior cymba conchae and a larger inferior cavum conchae.

Dividing the root of the helix from the tragus is the anterior incisura. The tragus is a firm cartilaginous projection anterior to the ear canal. Inferiorly, the intertragic incisura divides the tragus from another cartilaginous projection, the antitragus.

At the most extreme inferior aspect of the ear is the lobule. This is a fibrofatty flap of tissue exhibiting varying degrees of morphologic development: round, flat, triangular, freely hanging, and partially or totally adherent to the adjacent scalp and cheek.

An abundant arterial supply is provided from the superficial temporal and the posterior auricular arteries. The sensory information is principally supplied by the greater auricular nerves (C2, C3) via its anterior and posterior branches. The anterior branch supplies the lower half of the lateral surface of the auricle, and the posterior branch supplies the lower portion of the medial

surface of the auricle. The facial auriculotemporal nerve supplies not only the superior lateral surface of the ear but also the skin of the anterior and superior surfaces of the external auditory canal skin. The superior medial or cranial surface of the ear is supplied by the lesser occipital nerve. An auricular branch of the vagus nerve, known as Arnold's nerve, supplies a portion of the conchal cavity and the posterior canal wall.

The Frankfort horizontal line being identified as a projection from the upper aspect of the external auditory canal to the infraorbital rim, the top of the ear corresponds to the level of the lateral brow. An axis identified through the longest dimension of the ear called "line of balance" is noted to be approximately 20 degrees from the vertical plane. In addition, the ear lies approximately one ear length posterior to the lateral orbital rim. An ear positioned too superiorly, too inferiorly, too anteriorly, or too posteriorly is readily noted as being abnormal.

Ear protrusion has been measured in both degrees and centimeters. A normal amount of ear protrusion in the adult is 25 to 30 degrees. Vollmer found the ear protrusion of infants to be 20 degrees, that of adults 30 degrees, and that of the aged 25 degrees. Measured in centimeters, protrusion of the normal ear varies from 1.7 to 2.5 cm. The Caucasian male has an average auricle height of 63.5 mm and a width measuring 50 to 65 per of that length. As suggested by Adamson and colleagues, 85 per cent of the growth of the ear occurs before the age of 3 years and the remaining 15 per cent up until the age of 20. Increases in ear length beyond the age of 20 result from elongation of the lobule secondary to gravitational forces.

The normal angle between the concha and the scapha varies from 75 to 105 degrees. An ear is described as protruding when the conchoscaphalic angle exceeds 110 degrees, the angle of the ear with respect to the side of the head is greater than 40 degrees, or the helical rim protrudes more than 3 cm. Either one or a combination of many different characteristics can contribute to the lop-ear deformity. The primary characteristics of the congenital lop-ear deformity are (1) a poorly developed anthelix, (2) excessive conchal cartilage, and (3) an overprojected lobule. The anthelix can be underdeveloped in any portion of the fold but underdevelopment of the superior crus is most significant. The flattening of the superior crus results in an increased conchoscaphalic angle, so that there is no delineation between the scapha and the fossa triangularis. In contrast, the inferior crus is usually well developed. An excessively large conchal bowl can occur secondary to either a uniform or a focal excess of conchal cartilage. An illusion of a hypertrophic conchal bowl may also result secondary to hypertrophy of the retroauricular muscle, excess retroauricular fat, or a hyperpneumatized and overprojected mastoid bone.

The normal conchoscaphalic angle is 75 to 105 degrees. When the angle exceeds 110 degrees, the ear is described as protruding. (From Tanzer, RC: Congenital deformities. In Converse, J (ed): Reconstructive Plastic Surgery Vol 2, 2nd ed, Philadelphia, WB Saunders Company, 1977, p 1710.)

If a disparity exists so that there is an excessively large conchal rim with respect to a shortened helix, a cup- or shell-ear deformity may result. Features of the cup ear include an

overhanging helix, flattening of the curved helical arch, and compression or narrowing of the scapha and fossa triangularis. As a result of these deformities, there is lidding, protrusion, and decreased ear size. The ears also appear to be set lower in position than normal.

An ear that has general auricular enlargement, an excess of conchal cartilage, and a poorly defined helical rim on a weak cartilaginous framework has at times been referred to as a Machiavellian ear by Converse and Wood-Smith. Additional abnormalities that may contribute to a prominent ear deformity are hypertrophy of Darwin's tubercle, an overprominent tragus or antitragus, and side-to-side asymmetries.

Historical Perspectives and Significant Contributions

An oft-cited reference to the first published otoplasty is the book by Dieffenbach, *Die Operativechirurgie,* published in 1845. Translation of both the Danish and German editions describes a surgical correction for traumatic injuries of the pinna, such as local flap repair, scar revision, and earlobe reconstructions. Reference to the congenital lop-ear deformity is not included in this description. Consequently, an otologist named Edward Ely should probably be credited with the first description of the otoplasty technique. In 1881 he described the repair of a lop-ear deformity in a 12-year-old boy suffering from extreme harassment because of his prominent ears. Along with Ely, Keen (1891), Monks (1890), Cocheril (1894), and Morestin (1903), all described various combinations of skin excision, conchal cartilage incision and excision, and suturing of the auricular cartilage to the mastoid periosteum.

It was Luchett (1910) who first appreciated the absence or underdevelopment of the anthelix as a contributing factor to the lop-ear deformity. He excised a crescent of medal skin and cartilage to reconstitute the anthelical fold. This procedure, however, was complicated by a sharp ridge formed by incision into the cartilage. Excising segments of the scapha and concha while incising the cartilage along the intended inferior crus of the anthelix, MacCollum (1938), and later Young (1944), employed surgical principles directed at both the anthelix and concha to correct the anatomic deformity. These methods produced a satisfactory auricular contour, but the final surgical result was complicated by sharp margins in the areas of the cartilaginous incisions. In an attempt to soften this effect, McEvitt (1947) made multiple small parallel incisions along the line of the anthelix. Appreciating the need for a superior crus as described by Luchett, Erich (1958) made parallel incisions in the site of the intended superior crus to create a narrow strip of cartilage that would slide forward, blunting the sharp cartilaginous edges. Modifications of this technique such as overlapping or beveling of the edges were described, but sharp cartilage margins were still evident postoperatively.

In an effort to break the cartilaginous spring without actually making through-and-through incisions, Davis and Kitlowski (1937) described various methods of cross-hatching, shaving, and excising elliptic cartilaginous segments from the anthelix to maintain an appropriate permanent contour. Converse and colleagues (1955) and Stark and Saunders (1962) used burs and wire-brushes for the like purpose of weakening the anthelix.

In order to maintain a normal postauricular sulcus and to avoid the sharp ridges along the lateral aspect of the anthelix that invariably result from excision of a strip of cartilage along the entire anthelix, Becker (1949) proposed the removal of cartilage only along the margin of the concha and the anthelix. He further removed the cauda helicis to correct the problem of a prominent and protruding lobule.

Farrior (1959) proposed a technique of partial thickness removal of longitudinal wedges. In 1910 Luchett wrote: "In an ear with a very thin flexible cartilage, I think it would be possible to reconstruct the anthelix and set the helix close to the head without excising a segment, or even incising the cartilage simply by fluting or folding the cartilage at the proper site, and passing the suture in such a manner as to maintain the fold. On the basis of this premise, Owens and Delgado described a technique that was later popularized by Mustardé, who restored the role of the superior crus by using simple permanent mattress sutures to maintain the correct position. A widespread following of the Mustardé technique resulted because of its simplicity, expediency, and reproducibility.

In 1958 Gibson and Davis showed that a cut surface of cartilage causes a propensity for the cartilage to bow in the opposite direction. Chongchet (1963) undermined the lateral surface of the auricle and made multiple partial-thickness incisions into the cartilage along the superior crus to develop a fold in that area. The combination of postauricular skin excision and scoring of the lateral anthelix was employed by Stenstrom (1963), who used a special scoring instrument delivered postauricularly near the caudal helicis.

Kaye (1967) proposed a technique of anterior scoring along the superior crus through a medial auricular incision supplemented with suture fixation along the anthelical fold. The mattress sutures used for fixation were placed through small incisions on the lateral surface of the auricle. Kaye revised his technique in 1973 by placing the mattress sutures postauricularly as in the Mustardé technique.

In patients for whom an excess of conchal cartilage is the primary cause of the protrusion, Furnas (1968) reemphasized the importance of fixing the auricular perichondrium to the mastoid periosteum.

Authors' Surgical Technique

Since the auricle undergoes approximately 85 per cent of its growth during the first 6 years of life, surgical correction of the lop-ear deformity is generally avoided in patients under 5 or 6 years of age. Coincidentally, this is usually when the child first becomes aware of the deformity and begins to receive the ridicule of peers. Nevertheless, older children and adults still seek otoplasty to correct their physical deformity. Because multiple malformations can contribute to the deformity and because no two ears are identical, the procedure should be adapted to the individual's basic needs.

We prefer to perform the otoplasty procedure with the patient in a so-called "twilight anesthesia"; however, this is not feasible for children younger than 13 or 14. In younger children or older children of lesser maturity, general endotracheal anesthesia is used. In adults and older, more mature children the authors prefer to perform the procedure under local anesthesia with intravenous sedation administered by a nurse anesthetist or an anesthesiologist. The following preoperative and intraoperative regimen has been used for several years with excellent success and patient comfort, and less than a 1 per cent incidence of nausea. Preoperative medication consists of orally administered diazepam (Valium) (10 to 20 mg) and dimenhydrinate (Dramamine) (200 mg). No intramuscular preoperative medication is used, and all other medications during the intraoperative period are administered intravenously by the anesthetist. Continuous cardiac and blood pressure monitoring is given to all patients. Arterial oxygen saturation is also monitored with a pulse oximeter. Intraoperative fentanyl citrate (Sublimaze) and midazolam (Versed) are titrated according to the patient's level of consciousness.

The postauricular skin incision is then marked as a line approximately 1 cm from the free border of the helix and extending from the upper pole of the auricle at the cephaloauricular junction to the lower pole inferiorly. The medial aspect of the skin excision is then placed in the retroauricular sulcus in most cases. When the auricle is unusually large, it requires a marked degree of setback; if there appears to be loose redundant skin, the medial incision may even be extended onto the mastoid process.

Infiltration anesthesia is obtained with 2 per cent lidocaine (Xylocaine) containing 1:100.000 epinephrine, injected at least 20 minutes before the procedure is begun. We have found this a most important tenet for bloodless surgery. The skin is incised with a No. 15 Bard-Parker scalpel blade and a plane of dissection is created between the subcutaneous tissue and perichondrium. Strict hemostasis is obtained with bipolar cautery throughout the procedure. The wound edges are undermined to expose the entire extent of the posterior cartilage surface. Not only does this generous postauricular skin excision aid in reduction of the prominent ear, but it provides excellent exposure for the remaining portion of the procedure.

To reduce the bulk of the conchal cartilage and to aid in the setback of the conchal bowl, a No. 10 Bard-Parker scalpel blade is used to remove partial-thickness ellipses along the convex portion of the conchal cartilage. Usually, three or four separate areas are shaved in this manner. The auricular prominence is then reduced with digital pressure and an anthelical fold is created. Needles (25-gauge) are placed through the anterior surface of the ear to delineate where Mustardé sutures are to be placed. In smaller ears, three sutures are usually adequate; in larger ears, four or five buried mattress sutures are necessary to achieve a smooth contour. Taking care to include the full thickness of the auricular cartilage, including the perichondrium on the anterior aspect, Mustardé sutures of 4-0 clear Prolene are placed according to the position of the 25-gauge needles. The sutures at this point are left untied until all the sutures are placed, to allow for better visibility and placement of subsequent mattress sutures. After all the Mustardé sutures have been placed, the knots are tightened to create a satisfactory anthelical contour while the anterior aspect of the auricle is visualized. If the roll of the anthelix is irregular, misplaced, or otherwise unaesthetic, the sutures should be removed and replaced so as to achieve the desired anthelix.

The auricle is next assessed to determine the need of a conchal setback. If a hypertrophic posterior auricular muscle and ligament is present or if there is a large amount of retroauricular fat, this tissue is excised to allow the conchal bowl to sit nearer the scalp. With care to preserve the branches of the greater auricular nerve, the deep fascia over the mastoid is exposed. A full-thickness suture, including conchal cartilage and anterior perichondrium, of 4-0 clear Prolene is used to fix the conchal bowl to the mastoid periosteum. One suture is often adequate, but two or even three may be required. Through experience and trial and error, the correct position for placement of the sutures is achieved. The bite into the mastoid fascia should be slightly posterior with respect to the bite of the conchal cartilage. If the suture is placed too anteriorly with respect to the mastoid fascia, the conchal cartilage may project anteriorly, narrowing or even closing the external auditory meatus.

At this point, the ear is once again examined for adequate correction. Strict hemostasis is noted and the postauricular incision is closed with a running, interlocking 5-0 plain catgut suture. As hematoma has not been a complication in our hands, we do not drain the wound.

If the lobule is still protruding, further skin excision usually alleviates the problem.

At the completion of the procedure, bacitracin-impregnated cotton is placed into all the creases on the anterior surface of the ear and into the postauricular sulcus. A bilateral mastoid dressing of fluffed sponges and 3-inches Kling is then applied.

Postoperatively, the mastoid dressing is left in place for 4 days. At this time the dressing is removed and the suture line cleaned with peroxide. A generous portion of bacitracin is applied to the postauricular incision. Patients are instructed to clean the incision three to four times daily and apply the bacitracin ointment; the ointment facilitates absorption of the sutures, and when patients are seen at their 10-day visit the sutures do not require removal. For 1 week after the mastoid dressing has been removed, patients are instructed to wear an elastic headband 24 hours a day. For the next 7 days they are told to wear the headband at night, and after this no further care is needed.

Complications

With any surgical procedure certain complications may occur, such as bleeding, hematoma, pain, and infection. Still other complications may relate to the area operated on, and more specifically, the surgery performed in that area. For otoplasty many different techniques may be used to achieve an acceptable postoperative result and also an acceptable complication rate. Given the number of surgical procedures performed by any surgeon, a certain percentage of complications must be expected. Since it is much easier to describe a good result and define a new technique than it is to report a complication or complication rate, reports of the incidence of various complications are somewhat scant throughout the literature. Baker and Converse, reporting on the 20-year retrospective experience of 292 patients (570 ears) who underwent otoplasty involving a "tubing technique", found the following complications:

	No. of Ears	
Infection	7	1.2%
Chondritis	4	0.7%
Hematoma	5	0.8%
Hypertrophic scars	4	0.7%
Keloids	1	11.0%
	12	2.1%
Telephone deformity	9	3.0%
Recurrence of deformity	15	2.6%.

Milojevic found the following complications in 244 operative cases:

	No. of Patients	
Hematoma	2	0.8%
Perichondritis	0	0.0%
Wound infection	0	0.0%
Wound dehiscence	3	1.2%
Skin necrosis	0	0.0%
Upper protrusion	4	1.6%
Lower protrusion	3	1.2%
Keloid	1	0.4%.

In Mustardé's 10-year follow-up of 97 patients, he found a 1.8 per cent recurrence rate and a 1.0 per cent complication rate overall.

Early Postoperative Complications

Infection. Because of the good blood supply to the head and neck region, infection is a relatively uncommon occurrence. A hallmark of infection is pain occurring approximately 12 hours or more after the operation. Removal of the dressing is indicated, and if any fluctuant or purulent drainage is noted, appropriate cultures are taken. Infection may also occur as a result of an undiagnosed hematoma; if this happens it occurs on approximately the fourth or fifth postoperative day, and similarly pain associated with fever, erythema, swelling, and purulent discharge is noted. In this event, the infected debris needs to be removed, necessitating at least partial opening of the wound. Focal cellulitis can often be treated with broad-spectrum oral antibiotics and warm compresses, but a more fulminant infection may warrant hospitalization, parenteral antibiotics, and removal of any nonabsorbable buried sutures. Some authors have advocated the placement of small Silastic catheters into the wound with continuous irrigation of broad-spectrum antibiotics to avoid progression to perichondritis or chondritis.

Hematoma. Hematoma occurs in less than 2 per cent of reparative otoplasties, but when it occurs it is an immediate problem that requires prompt and vigorous treatment. A harbinger

of this complication is persistent pain; this necessitates removal of the dressing and inspection of the ears. If a hematoma is present there will be a tense, bluish swelling in the retroauricular crease with surrounding ecchymosis. A hematoma warrants return to the operating room where evacuation of the clot and cauterization of any appreciated bleeding points is undertaken. After wound closure and reapplication of a pressure dressing, patients should be placed on a broad-spectrum antibiotic to avoid possible postoperative infection.

Pain. As already mentioned, the presence of pain postoperatively during otoplasty should raise the suspicion of either infection or hematoma. It should not be assumed that a patient requiring a large amount of narcotics to control the pain has a low tolerance or does not tolerate a tight pressure dressing. If pain occurs postoperatively, especially if it is unilateral, the dressing should be removed and the ears inspected. A tight or inappropriately placed dressing may cause excessive pressure on the ear, which can lead to pain. Pain, pruritus, edema, and erythema may indicate a local sensitivity reaction to the dressing material or a topically applied medication. In this case, removal of the dressing, cleansing of the ear, and application of a dressing made of different material are required.

Skin Necrosis. Although this is not a common problem, skin necrosis may occur secondary to an overtight dressing; excessive pressure on the ear may result in avascular necrosis. In addition, folding or twisting of the repaired ear may cause inadequate blood supply to a portion of the ear and result in skin necrosis to that area. Stal and Spira found that such wounds subsequently healed well without any long-term sequela.

Perichondritis and Chondritis. An undetected or inadequately treated hematoma in the early postoperative period is the usual cause of perichondritis. Nevertheless, severe infection of the overlying soft tissues may unexplainably result after otoplasty and always carries with it the possibility of deeper spread of infection. The perichondrium is an excellent barrier to the spread of infection, but if infection should spread deeper, chondritis may result; this is the most dreaded complication of the otoplasty procedure. Although it is commonly seen after a thermal burn because of the lost protective mechanisms of the skin, frank chondritis with necrosis of the ear is rare after otoplasty. Dowling and colleagues described the classic clinical picture of suppurative chondritis as (1) progressive pain refractory to narcotics; (2) a hot, tender, erythematous, and edematous ear; and (3) increase in the auriculocephalic angle with recurrent prominence of the auricle and loss of surgical correction. Because the cartilage itself is relatively avascular, frank chondritis is usually resistant to systemic antibiotics. Continuous antibiotic irrigation through catheters placed in the wound may be of some benefit. Irrigating necrotic debris from the wound with hydrogen peroxide and delivery of antibiotics through iontophoresis have shown favorable results in the treatment of chondritis, but progression of the infection in spite of aggressive therapy is the norm. Wide exposure and aggressive debridement of all infected cartilage is often necessary. As there is no sharp demarcation between infected and viable cartilage, differentiation is often difficult. If there is total involvement of the auricle, total pinnectomy may be warranted. Resolution of pain is probably most indicative of successful treatment of the infection, yet a resulting severely deformed auricle could be expected.

Late Postoperative Complications

Keloid Formation. Because of the thinness of the dermis in the postauricular skin, hypertrophic scarring and keloid formation is rare in this area. The incidence is more common in patients whose ears are placed under excessive tension, but it is impossible to predict. Close follow-up in the postoperative period may make it possible to halt progression of a hypertrophic scar into true keloid formation. As the keloid develops, auricular prominence is once again noted secondary to the bulk of the lesion. Once the condition is recognized, triamcinolone may be injected on a biweekly basis until the lesion resolves. Occasionally, excision of the keloid and subsequent steroid injection into the postoperative wound can avoid keloid formation. Patients who have shown a tendency toward keloid formation are certainly at risk of recurrence of the keloid on subsequent surgical attempts. Some authors have advocated low-dose radiation to treat resistant keloids, but the danger of chondritis and tumor induction make such therapy unwarranted in the vast majority of cases.

Bowstringing of Sutures. A complication occasionally seen with the Mustardé technique is the presence of the buried permanent mattress sutures outlined below the postauricular skin. This is most noticeable in ears that have thick cartilage and in which the wound is closed with an unusually large amount of tension, or when an excessive amount of postauricular skin has been excised. This complication may occur months to years after the surgical procedure, is usually of no consequence, and requires no specific treatment. Only on occasion do the sutures extrude beneath the thin, tight, and atrophic overlying skin. In the event of extrusion, suture removal is warranted, but this is usually of no consequence with respect to the position of the ear in the late postoperative period. The complication can be minimized by reducing the distance between the scapha and the concha when creating the anthelical fold. In addition, increased wound tension and excessive skin excision should be avoided.

Suture Granulomas. Although described as a complication, the formation of sinus tracts from the sutures to the skin is rarely seen with the Mustardé technique. Mustardé believes that one of the causes for this problem is failure to expose the posterior perichondrium from the helical margin to the scalp. Performing a wide dissection ensures that the wound closure does not lie in the proximity of the mattress sutures. Sutures left in too long may also predispose to this problem. If sinus formation does occur, conservative treatment is indicated. A small dressing should be applied and left in place for 6 months after the operation; the sutures can then be removed and the ear may be expected to maintain a good position.

Extrusion of Sutures. As mentioned in relation to some of the above complications, sutures placed too near the skin and under undue tension may have a tendency to extrude. Extrusion of a suture may also result secondary to an episode of infection or sinus formation. If extrusion occurs in the late postoperative period, after approximately 6 months, removal of the extruding suture should have no effect on the ultimate outcome of the otoplasty.

Hypesthesia. Sensory deficit in the early postoperative period is frequently seen after otoplasty. The sensory loss is usually secondary to trauma of the greater auricular nerve as it

passes over the mastoid fascia. The nerve is especially at risk during the conchal setback or reduction technique, and care must be taken to avoid any injury to the nerve in this area. Permanent paresthesias, permanent sensory deficits, and neuroma formation have not been described, and the sensation usually returns fully over a period of months.

Unfavorable Results

Stenosis of the External Auditory Canal. Narrowing of the external auditory canal is a complication of the Furnas technique of conchal mastoid sutures. If sutures are placed too anteriorly to correct the large or overangulated concha, the somewhat mobile conchal cartilage can be drawn forward into the meatus, narrowing or even obstructing it. Placement of the sutures in a more infraposterior position remedies this problem. On occasion the conchal cartilage may need to be trimmed of excess cartilage anteriorly before proper placement of the conchal mastoid sutures.

Recurrence of Deformity. As there is always a tendency for the reconstructed anthelix and superior crus to unfold slightly, the ear should always be somewhat overcorrected intraoperatively. Nevertheless, certain factors may contribute to a recurrence of the deformity. When some form of the Mustardé technique is used, failure to place the sutures through the full thickness of the cartilage or use of too few sutures may result in cutting of the suture through the cartilage and release of the anthelical fold. This is especially true in ears with thick cartilage placed under excessive tension. Relying on the skin excision alone to maintain the proper auricular contour is not in itself adequate to correct the deformity. It is well known that skin placed under tension has a tendency to stretch or creep to correct the tension. As a result, while it may appear that appropriate correction is obtained intraoperatively, postoperatively there will be a tendency for recurrence of the deformity. For the noncompliant patient who does not adhere to appropriate postoperative management as instructed, such as nightly dressings, the auricle may become traumatized and move back to the outward position. In addition, there may be a higher incidence of recurrence with absorbable sutures, postoperative trauma, or postoperative infection. Recurrence of the deformity, for whatever reason, is disappointing to both surgeon and patient, but fortunately this does not necessarily place the patient at a higher risk for recurrence on subsequent procedures. A properly performed procedure with identification of the insighting problem can still produce a very satisfactory result.

Telephone Deformity. As the name implies, telephone deformity results from an overprotruding upper and lower third of the ear in conjunction with the middle third being set close against the side of the head. The patient with an excessively large ear or a wide scapha may be at increased risk for this type of deformity if strict attention is not paid to the upper and lower thirds of the ear. Correction of this deformity can be difficult, especially if it is a result of an overaggressive removal of conchal cartilage from the central third. If this is the case, the upper third of the ear needs to be placed very near the head in order to meet the middle third. The result may be an excessively setback ear. Skin excision to bring the lobule closer to the ear usually produces a satisfactory result.

Reverse Telephone Ear Deformity. A reverse telephone ear deformity results from an overaggressive setback of the helical rim with inattention to a hypertrophic conchal bowl. As a result, the helical rim is set close to the head, and the conchal bowl protrudes. This complication can be avoided by proper preoperative analysis of the individual deformity and use of the appropriate surgical techniques.

Excessive Setback. The complication of excessive setback is often of more concern to the surgeon than to the patient. Having had the lop-ear deformity corrected, patients are often willing to accept this result. Nevertheless, as the normal distance between the helical rim and mastoid is approximately 2 cm, any correction below 1.8 cm will likely give a pinned-back appearance. This complication can result when there has been an overzealous attempt at correcting a deep conchal bowl, when an excessively sharp anthelical fold has been created, or when an excessive amount of postauricular skin has been removed. Surgical correction usually is not needed. Spira described a technique of placing soft silicone or latex rubber wedges of gradually increasing size into the postauricular sulcus over a period of several weeks to achieve protrusion of the auricle. If this is unsuccessful, a postauricular skin graft may be required.

Obliteration of the Postauricular Sulcus. Seen in association with excessive setback, obliteration of the sulcus is secondary to excessive skin resection and placement of an unreasonable burden on this technique for correction of the deformity. It is fairly well established that skin excision alone is not sufficient to treat the prominent ear. As a result, reliance on other maneuvers should be of primary importance, with resection of postauricular skin only adjunctive to other corrective techniques.

Protruding Lobule. We have found that if the conchal bowl has been adequately reduced, skin excision alone is usually adequate for correction of the protruding lobule. Some authors have advocated resection of the cauda helicis to help control lobule protrusion, but this can result in an irregular curve, retraction, or notching along the inferior conchal border. Becker described a technique of vertical splitting of the cauda helicis posteriorly and suturing it to the concha or mastoid periosteum. Once again, we have found that adequate attention to the conchal bowl usually enables skin excision alone to alleviate this problem.

Anthelical Deformities. Failure to appreciate the specific cause of the deformity preoperatively, and failure to tailor the operative procedure appropriately to the deformity, predisposes to unfavorable results. Through-and-through incisions into the cartilage to create the anthelix can produce sharp edges. These edges may not be appreciated postoperatively, but the deformity will manifest itself as the swelling subsides. These edges are not softened by subsequent scar formation.

Failure to reconstruct adequately the normal curvature of the anthelix into the superior crus can result in the appearance of a vertical post, which, once formed, is very difficult to correct. Contour irregularities of the anthelix can result from sutures placed in an incorrect position or at an incorrect amount of tension. In addition, if an inadequate number of sutures are used, anthelical irregularities may result. Irregularities noticed at the time of surgery do not

correct themselves postoperatively; the time for correction is when they are noticed. If the anthelical fold is malpositioned, the ear will have an operated-on appearance. Creating too narrow an anthelical fold, by not spanning a sufficient amount of cartilage when the mattress sutures are placed, will result in a tight narrow roll and the scapha will appear inappropriately large.

Few patients are as grateful as those who have had a successful otoplasty procedure. Especially in the case of children who have been subjected to peer harassment and ridicule, the correction of this anatomic deformity can have a profound psychological effect. An increase in self-image and confidence may result directly from this procedure.

Since patients are often so relieved to have their prominent ears corrected, the surgeon is much more critical of his or her efforts than is the patient. The goal of otoplasty should be to achieve ears that are symmetrically contoured and appear unoperated and natural. McDowell stated that the convolutions should be represented by smooth undulations, that there should be a continuously convex helical contour, and that when viewed from the front, the rim of the helix should be visible behind the body of the anthelix. Ideally, the ear should protrude from the scalp for a distance of approximately 1.7 to 2 cm. To achieve these goals, an accurate preoperative assessment of the specific anatomic deformity is needed. Tailoring the surgical procedure to the specific needs of the patient, rather than employing a standard procedure, is necessary for an aesthetically pleasing result. As no two ears are identical, no two patients require exactly the same surgical procedure, and the technique should be flexible enough to address the specific needs. As stated by Tolleth, "... close examination of an ear that 'looks right' will indicate that obtrusiveness, excessive size, abnormalities of position, and distortion of parts have been avoided. Creating an ear that looks right, however, is not a license to exceed the bounds of sensibility or allow private manifestation of godlike originality". The aesthetic ear is in proportionate harmony with both the sides of the head and its component parts; the challenge of the otoplasty procedure lies in achieving this goal.