Thomas Procedures in
FACIAL PLASTIC SURGERY
Aesthetic Otoplasty

英文原版

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PETER ADAMSON & JASON LITNER

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English reprinted edition of Thomas Procedures in Facial Plastic Surgery: Aesthetic Otoplasty by Peter A. Adamson and Jason A. Litner

The original English language work has been published by People's Medical Publishing House-USA, Ltd.

Reprinted by People's Medical Publishing House

Beijing, China

图书在版编目（CIP）数据

Thomas 面部美容整形 . 耳部整形：英文 /（美）彼得 · 亚当森（Peter Adamson）主编 . —北京：人民卫生出版社，2017

ISBN 978-7-117-25549-3

Ⅰ. ①T… Ⅱ. ①彼… Ⅲ. ①面 – 整形外科学 – 英文 Ⅳ. ①R622

中国版本图书馆 CIP 数据核字（2017）第 285531 号

图字号：01-2014-4511

Thomas 面部美容整形：耳部整形

主　　编： Peter Adamson
出版发行： 人民卫生出版社（中继线 010-59780011）
地　　址： 北京市朝阳区潘家园南里 19 号
邮　　编： 100021
E - mail： pmph @ pmph.com
购书热线： 010-59787592　010-59787584　010-65264830
印　　刷： 北京盛通印刷股份有限公司
经　　销： 新华书店
开　　本： 787 × 1092　1/16　**印张：** 10.25
字　　数： 249 千字
版　　次： 2017 年 12 月第 1 版　2017 年 12 月第 1 版第 1 次印刷
标准书号： ISBN 978-7-117-25549-3/R · 25550
定　　价： 129.00 元
打击盗版举报电话：010-59787491　E-mail：WQ @ pmph.com
（凡属印装质量问题请与本社市场营销中心联系退换）

Preface

Otoplasty is often casually approached as a quick and relatively painless procedure, but the surgeon who is most knowledgeable understands the complexity of this 'simple' operation. Overcoming the intrinsic cartilaginous spring of the native auricle to reproduce a naturally symmetrical and stable contour, remains a very challenging proposition. Every good operation begins with a meticulous assessment and assiduous operative planning. Assurance of a satisfactory otoplasty result rests also on fastidious execution of that plan with a view towards reinforcing the stability of the cartilaginous auricular framework. Our graduated technique, starting with conservative postauricular skin excision and conchal setback, and followed by antihelical shaping via precise suture placement, has yielded exceedingly reproducible outcomes and a high degree of patient satifaction in our hands. Supplementary adjustments can then be individualized based on the persistent deformity noted. We reserve cartilage-cutting techniques for the rare instance of a densely thickened or inflexible cartilage that is refractory to cartilage-sparing manipulations.

A formula for enduring success with this fascinating aesthetic procedure combines an appreciation for anatomic nuance with painstaking attention to detail and untiring intraoperative reevaluation. The vast number of known otoplasty methods is a tribute to the level of difficulty involved in this procedure. The objective of this volume is to provide a critical and comprehensive review of the state-of-the-art of our specialty as it relates to cosmetic auricular surgery. It is our hope that this information has been distilled to the extent that surgeons of every experience level may find some surgical pearls within these pages that are of some use to their current and future practice of otoplasty. Whatever the preferred maneuvers, adherence to the goals and principles outlined in this volume will help to circumvent the manifold pitfalls associated with this challenging but rewarding operation.

Peter A. Adamson, MD, FRCSC, FACS
Jason A. Litner, MD, FRCSC

Introduction

There is no question that, where estimation of facial beauty is concerned, the ear occupies a less prominent role than its other more central facial cousins such as the eye and the nose. Nevertheless, as those who suffer with them know well, prominent ears or *prominauris* can be a significant contributor to facial disharmony and unhappiness.

Many physicians are misled to believe that auricular surgery is easy. However, the achievement of perfect curvature of form and symmetry is as difficult today as when auricular surgery was first entertained and conceived some many hundreds of years ago. Dr. David Furnas, 30 years ago, said that surgery of the external ear was the one old-fashioned test for plastic surgeons, more than "sophisticated in-training examinations," and evaluations for recertification, which "unfailingly separated the accomplished journeyman from the rest of the crowd, with grading of the test done by the studied glance of the common man" (Clinics in Plastic Surgery, July 1978). This statement was a testament to the astonishing intricacy of the auricle's form and to our collective specialties' sometime failings in realistically recreating that form that nature intended.

In today's modern age of surgery, the statement rings as true as the day it was made. While technology has allowed other facial plastic surgical techniques to surge forward in scope and outcome, cosmetic otoplasty continues to rely on time-tested techniques that are at the same time gracefully simple, yet exceedingly difficult to reproduce in a consistently reliable manner.

This volume will review the history of cosmetic Otoplasty along with aspects of anatomy, embryology, and clinical evaluation relevant to the remediation of specific deformities. Our preferred technique will be detailed alongside those of others with specific reference to applications for the most commonly encountered auricular abnormalities. The volume has been organized in an effort to provide an easy-to-follow, step-by-step approach to cosmetic Otoplasty taken from pre-operative considerations through post-operative management. We hope you find it useful to your practice.

Peter A. Adamson, MD, FRCSC, FACS
Jason A. Litner, MD, FRCSC

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History and Philosophy

Peter A. Adamson, MD, FRCSC, FACS and
Jason A. Litner, MD, FRCSC

Introduction

Reconstructive otoplasty techniques have been famously chronicled as far back as the 7th Century B.C. by the texts of Sushruta[1] and those of Tagliacozzi[2] in the 16th Century. In the modern age, the first report of otoplasty is attributed to a Prussian surgeon, Johann Friedrich Dieffenbach[3] who, in 1845, wrote of otoplasty in his seminal two-volume work "Die Operative Chirugie" that detailed reconstructive and general surgical methods of every type. In it, he described simple excision of skin from the postauricular sulcus with sutures affixing the auricle to the mastoid periosteum for the treatment of a posttraumatic auricular deformity. This was designed to set back the entire pinna with a tension closure.

The first purely cosmetic otoplasty technique was recorded by Ely[4], in 1881, who performed a full-thickness wedge excision of skin and cartilage to reduce a prominent auricle (**Figure 1-1**). Problems with this through-and-through skin and cartilage excision included noticeable anterior scarring and a sharp fold in the cartilage. Attempts to improve upon the technique by reduction in unacceptable scarring were advanced through to the 1890s by Haug, Keen, Monks, Joseph, Cocheril, Ballenger and Morestin[5,6]. All of these techniques, however, were reductive in nature and focused on excision of conchal skin and cartilage.

In 1910, Luckett[7] identified the unfurled antihelical fold as the cause for the classic lop-ear deformity as opposed to simple protrusion caused by an exaggerated auriculocephalic angle. This revelation permitted a focused procedure to 'recreate' the antihelix while leaving the anterior skin intact (**Figure 1-2**). A crescentic or fusiform excision of posterior skin and cartilage was undertaken in the proposed location of the antihelix. The scaphal and conchal cartilage edges created by this technique were plicated. Scarring was noticeably improved with this procedure, but a sharply demarcated cartilage ridge often could not be avoided.

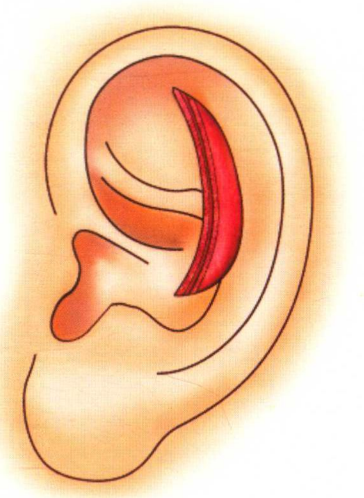

Figure 1-1. Ely's technique c. 1881. An anterior approach with full thickness crescentic excision of all layers for correction of the prominent ear.

Numerous modifications of Luckett's technique were soon to follow. In 1927, Alexander improved

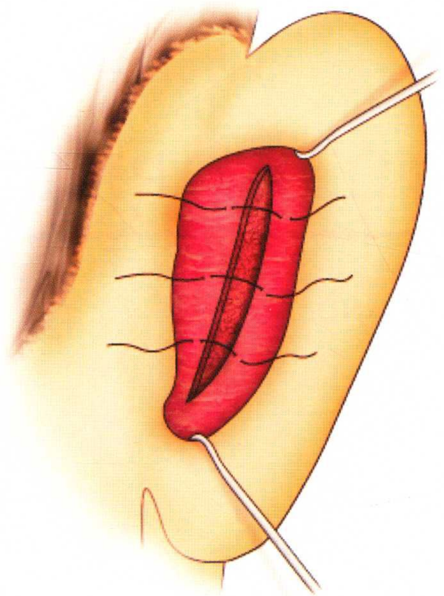

Figure 1-2. Luckett's technique c. 1910. Excision of a posterior strip of skin and cartilage along the desired antihelical line and plication with mattress sutures.

upon this technique by overlapping and suturing the cartilage edges in the high concha (**Figure 1-3**). In 1937, Davis and Kitlowski[8], pioneered the method of breaking cartilage spring via elliptical excisions of cartilage along the desired antihelical line, leaving intact "buttressing ridges" of cartilage to provide support. This was combined with stabilizing sutures and extensive postauricular skin excision to achieve a new antihelix. Sometimes, though, the postauricular sulcus was unnaturally obliterated with this procedure. Young[9] reported a modification in which a more conservative postauricular skin excision was proposed along with excision of superior crus cartilage to prevent forward 'lopping' of the superior pole. Nevertheless, an unsightly step-off at the antihelical line remained with these methods.

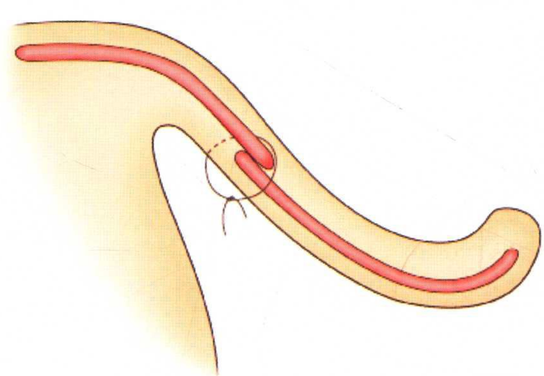

Figure 1-3. Alexander's technique c. 1928. Overlapping and fixation of the cut cartilage edges within the high concha.

The next significant advance is attributed to Becker[10] who, in 1949, described numerous cartilage excisions and incisions in an attempt to eliminate this unnatural ridging created by the earlier techniques and he used buried sutures to maintain these changes. Similarly, New and Erich used mattress sutures to maintain antihelical stability, but found that shaving or abrading the cartilage was just as adequate as excising whole fragments. Converse[11], in 1955, proposed a unique solution that eliminated the cartilage incision at the antihelical line to minimize the undesired ridging. Instead, parallel cuts were made isolating the antihelix via a posterior approach (**Figure 1-4**). Cartilage was then thinned with a wire brush, and tubed with suturing of the segments into elongated "cornucopias". Cartilage excision in the region of the concha was still advocated for treatment of excessive cupping. Additional contributions were made by Tanzer[12] in 1962.

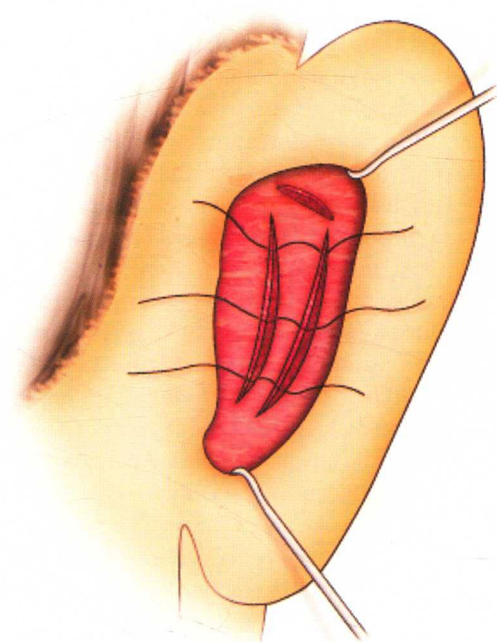

Figure 1-4. Converse's technique c. 1955. Slightly divergent incisions isolating the antihelix followed by thinning of the cartilage and tubing with mattress sutures.

Gibson and Davis[13], in 1958, demonstrated that relaxing incisions made in the perichondrium resulted consistently in bending of the cartilage in the opposite direction. Farrior[14] described a technique in 1959 that advised more judicious cartilage excision as compared to his predecessors, by excision of multiple longitudinal cartilage wedges to break cartilage spring before stabilizing the antihelix with suture. Stënstrom[15] described an otoplasty technique in 1963 that is still used by many today (**Figure 1-5**). This involved capitalizing on the tendency of cartilage to bend as noted by Gibson and Davis above. His was an anterior approach in which the lateral cartilage was scored or abraded to facilitate posterior bending via contraction of the intact posterior perichondrium. This technique was of particular utility in the setting of strong, stiff cartilage. However, it was frequently associated with anterior surface irregularities. Kaye[16] reported on his technique in 1967, which combined minimal-incision anterior scoring, posterior plication, and excision of a vertical ellipse of conchal cartilage.

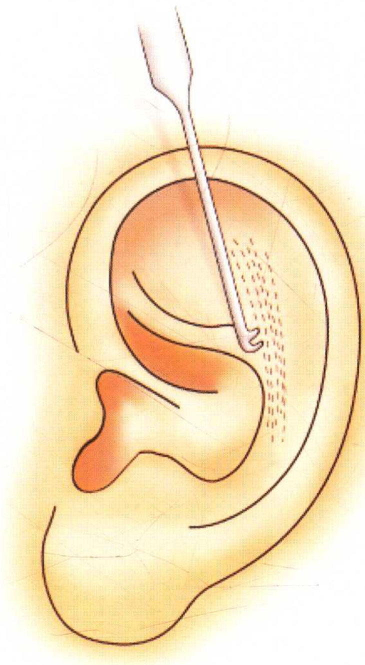

Figure 1-5. Stenström's technique c. 1963. Anterior subperichondrial scoring of the auricular cartilage at the proposed antihelical site using a specialized scratching instrument.

Despite the varied and important contributions of the past century, incisional and excisional methods, dubbed cartilage-cutting otoplasty techniques, still presented a nagging problem, the tendency for unseemly anterior antihelical and conchal surface deformities. There was a distinct frameshift in evolution of the technique through the 1960s towards what has come to be known as cartilage-sparing methods, with the notable contributions of Mustarde[17] in 1963 and Furnas[18] in 1968. The emphasis shifted for the first time from cartilage-cutting techniques to techniques that attempted to recreate the antihelical fold and set back the concha by use of suture alone (**Figure 1-6**). These approaches provided a more predictably natural auricular contour while eliminating displeasing anterior cartilage ridging.

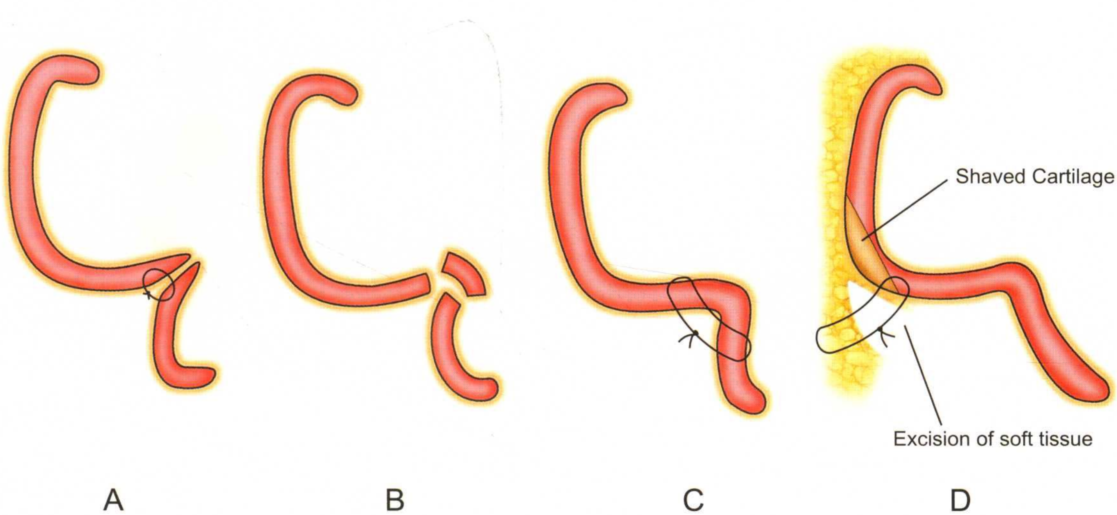

Figure 1-6. The historical evolution of otoplasty techniques from cartilage-splitting to cartilage-sparing methods. The technique of (A) Luckett, (B) Converse, (C) Mustardé, (D) Furnas and Webster.

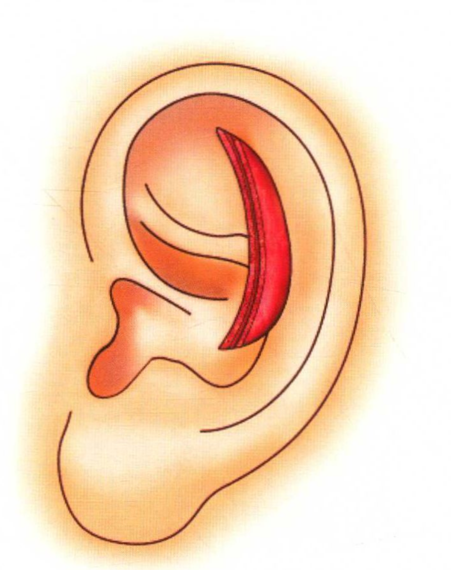

Figure 1-7. Mustardé's technique c. 1963. Recreation of the antihelix with three permanent transcartilaginous mattress sutures.

Mustarde, in 1963, described creation or redefinition of the antihelical relief using permanent transcartilaginous mattress sutures. Cartilage from the high conchal wall was 'borrowed' and rolled into the antihelix via scapha-conchal or scapha-fossa triangularis sutures, without the need for cartilaginous incisions and their associated surface irregularities (**Figure 1-7**). In 1968, Furnas revived the concept of concha-mastoid sutures meant to address excessive vertical conchal height or cupping, originating from Gersuny's and Miller's early descriptions[19,20]. He further reported on additional suture methods[21] in 1978, including fossa triangularis-temporalis fascia sutures to medialize a protruding superior crus, and ear lobe-mastoid sutures to medialize a prominent cauda helicus.

These techniques were rapidly adopted because of the efficiencies they provided and the evident improvements. Webster[22] should best be credited with assimilation of all available techniques to provide a comprehensive approach to otoplasty, elements of which he practiced as early as 1952. His unifying technique effectively incorporated posterior skin and soft tissue excision, judicious conchal resection, anterior cartilage scoring, and antihelical mattress sutures. Additional sutures could be added as necessary. Further auricular 'set-back' could be achieved by tangential shaving at the depth of the conchal bowl cartilage, as previously described by Wright[23] in 1970.

To date, there are reported to be over 200 known otoplasty techniques. Most of these, however, represent slight modifications of the techniques previously listed in this chapter. Substantive additions relate more to means rather than methods, such as the novel use, by Raunig[24], of a diamond-coated file for anterior cartilage scoring. Fritsch[24] has popularized a novel incisionless otoplasty technique employing suture techniques via a transcutaneous approach.

Modern otoplasty technique places principal emphasis on achievement of a smooth, continuous auricular contour that is in proper relation to the cranium without the telltale sharp cartilage edges reminiscent of classical otoplasty results. In the next chapter, we will review aspects of external ear anatomy and embryology germane to the practice of cosmetic otoplasty.

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2

Anatomy and Embryology

Peter A. Adamson, MD, FRCSC, FACS and
Jason A. Litner, MD, FRCSC

Introduction

Auricular protrusion may have some basis in evolutionary development because hearing can be demonstrably improved somewhat by cupping the ear or pulling it forward. While the concha is principally responsible for collecting sound waves and reflecting transmission into the external meatus, the auricular size and auriculocephalic angle also contribute to the acoustic resonance of the external ear[1]. Since much of our species no longer wanders the plains as a primary means of survival, the potential acoustic evolutionary fringe benefits of prominauris have ceased to be of importance. We are left only with its perceived aesthetic deficiencies or, at least, divergence from the 'norm'.

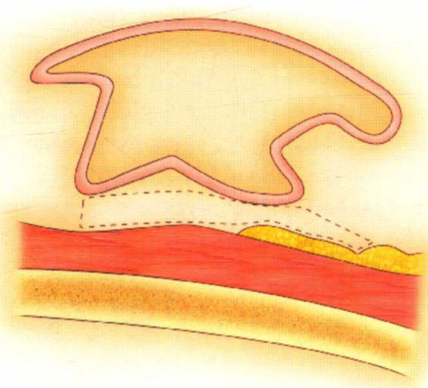

Figure 2-1. Cross-sectional view of the auricular cartilage demonstrating the relationship between cartilaginous framework and soft tissues.

Auricular Histology

The external ear is composed of a thin, adherent anterior layer of skin and a thicker, loosely attached posterior cutaneous layer with a modicum of intervening subcutaneous areolar tissue on its posterior surface. This soft tissue envelops a single plate of dense connective tissue comprising elastic cartilage of 0.5 to 1 mm in thickness invested by perichondrium (**Figure 2-1**). Only the lobule contains no cartilage. It lies caudal to the cartilaginous scaffold and is composed of fibrofatty tissue. Also known as yellow cartilage, elastic cartilage is shared by the external auditory tube, the eustachian tube, and the supraglottic larynx. Like the more prevalent hyaline cartilage, type II collagen is a prominent feature of its extracellular matrix but, in addition, it contains a dense network of delicately branched elastic fibers. This histologic distinction gives elastic cartilage its uniquely flexible properties.

While common in the developing body, cartilage is quite rare in the mature adult. Unlike other dense connective tissues, cartilage does not contain blood vessels or nerves, and depends on diffusion of nutrients for survival. Its extracellular matrix provides a powerful barrier to entry that makes it difficult, if not impossible, for antibodies and cells of the immune system to penetrate. The significance of these characteristics for facial plastic surgeons is that its low antigenic potential and slow metabolism makes cartilage, including that of the auricle, nearly perfectly suited for transplantation.

On the other hand, the chondrogenic activity of the perichondrium is limited to the period of active growth before the ear achieves full adult size. While matrix components can be produced throughout life, this production cannot keep pace with repair needs. If the cartilage is injured in adult life, the defect usually fills with fibrous tissue. A similar process arises when the cartilage is separated from its nutrient supply because of hematoma caused by trauma. This scenario affects the anterior cartilage contour exclusively, owing to the adherent nature of the perichondrium on the anterior surface of the ear. Although chondrogenic activity is minimal in this event, the fibrous tissue that arises within the intervening potential space can be quite dense. Along with this, scar contracture of the perichondrium itself may distort the auricular contour to produce the classic 'cauliflower ear' deformity.

Because of relatively poor access to nutrients, chondrocytes may atrophy with time. As water content decreases, small cavities develop in the surrounding matrix and these often become calcified. As a result, the adult ear's cartilaginous framework normally becomes less resilient with time. This point is well taken by otoplasty surgeons because technical maneuvers may need to be more aggressive in older patients in order to achieve and maintain the desired alterations.

Auricular Embryology

Embryology of the pinna is of greater interest to the reconstructive surgeon facing microtia repair. This is because the frequent coexistence of certain deformities of the pinna, acoustic canal, and middle ear structures may inform aspects of the planned repair. These elements are less informative with respect to cosmetic otoplasty but, nevertheless, they will be briefly reviewed.

The future ear makes its debut in the developing fetus in the third week of life with the emergence of the otic placode. The pinna itself is first apparent in week 6 of intrauterine existence as the hillocks of His[2], six primordial swellings or excrescences surrounding the dorsal surface of the first branchial groove. The three most cranial hillocks are attributed to the first branchial (mandibular) arch while the three most caudal hillocks belong to the second branchial (hyoid) arch.

Some controversy exists among embryologists as to what exactly happens from this point onward (**Figure 2-2**). Professor His has contended that each

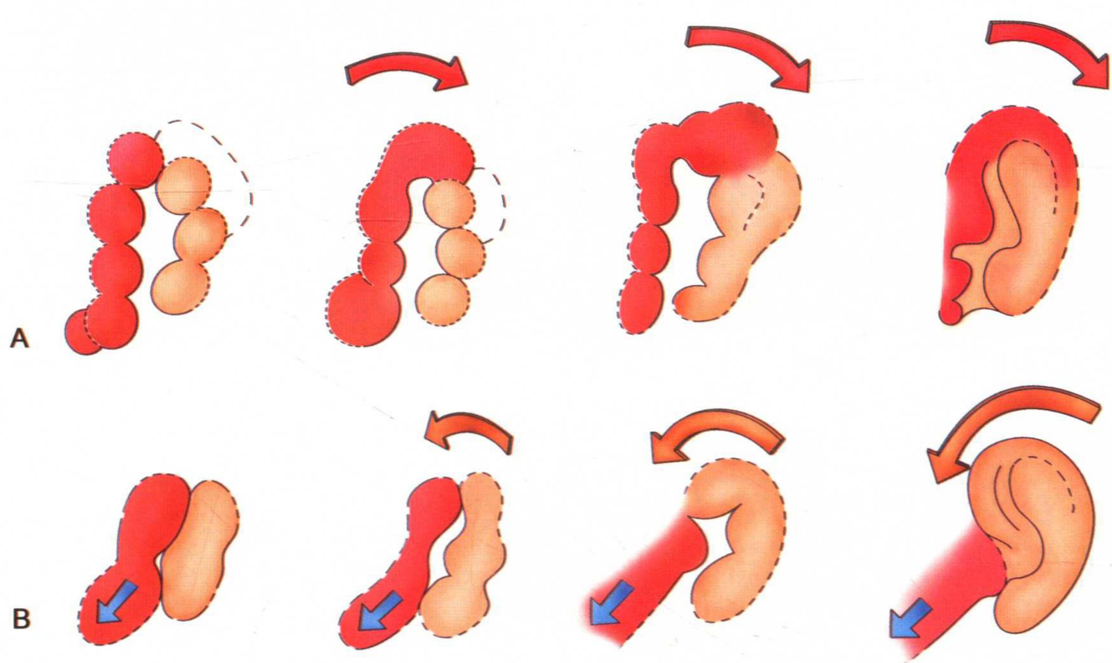

Figure 2-2. Theories of auricular embryology. (A) The theory of His in which the auricle is derived equally from the first and second branchial arches. Hillocks 1-3 are derived from the first branchial arch and hillocks 4-6 are derived from the second branchial arch. (B) The prevailing theory in which the first branchial arch contributes to the tragus and perhaps the helical root.

of hillocks 1-6 corresponds to a particular anatomic structure, namely, the tragus, the crus helicis, the helix, the antihelix, the antitragus, and the lobule, respectively. Schwalbe, conversely, has suggested that the helical margin emanates separately from a fold of skin adjacent to the hillocks and grows rapidly by the 12th week to overlie the underdeveloped antihelix[3]. Streeter[4], on the other hand, has deemphasized the hillocks entirely, contending that foci of mesenchymal proliferation are largely smoothed out by week 7 of development. Instead, the more rapidly growing hyoid arch mesenchyme increases its contribution to the pinna after week 8 to ultimately comprise 85% of the auricle. Only the tragus and, perhaps, the helical crus are derived from the mandibular first arch. This contention is supported by the anatomic location of congenital preauricular pits, which are located along a fusion plane at the intertragal incisure.

The concha, on the other hand, is thought to derive from the ectoderm of the first branchial groove. The upper portion forms the cymba concha, the mid-portion forms the cavum concha, and the lower portion forms the intertragal incisure. Failure of this aspect of auricular formation may lead to excessive lateral displacement of the pinna. Regardless of the specific derivations of the complex auricular structures, furling of the antihelix is thought to occur within the 12th to 16th weeks of development with furling of the helix occurring sometime later during the sixth month of gestation. Failure of these processes to occur correctly will result in an overhanging or protruding scapha.

Abnormalities of mesenchymal proliferation leading to congenital deformities of the pinna may have strong genetic determinants. These can account for the striking familial patterns that are seen with some auricular deformities. In fact, Rhys and Bull[5] found 59% of patients affected by auricular abnormalities reported a positive family history. The transmission pattern was demonstrated by Potter[6] in at least one family to be of autosomal dominant inheritance with variable penetrance. This pattern of transmission can probably be extended to a majority of auricular abnormalities. Rogers[7] speculated that the entire spectrum of auricular deformities is, in fact, a continuum whose phenotypic severity rests on the degree of penetrance for the affected individual.

Auricular Anatomy

The cartilaginous framework of the auricle described above defines the intricate topographic highlights and lowlights that distinguish the external ear. The major landmarks are illustrated (**Figure 2-3 and 2-4**). Elevations on the visible lateral or anterior surface are met with corresponding depressions on the medial surface. The ear is bound to the skull over one-third of its medial surface with

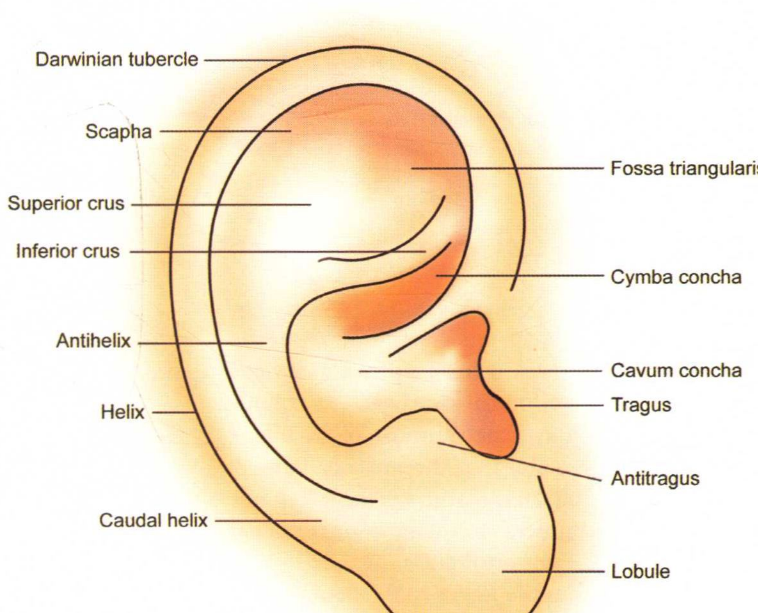

Figure 2-3. Anterior auricular surface topography.