

## Chapter 38: Aesthetic Evaluation of Nasal Contours

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The favorable correction of nasal deformities constitutes one of the most challenging areas of facial aesthetic surgery. Methods that allow an analysis of the individual steps for planning the correction and assessing the results can be invaluable, especially for the beginning otolaryngologist - head and neck surgeon. With any complex, difficult task, such as rhinoplastic surgery, baseline records and an understanding of their interplay are essential.

One of the first steps in planning any correction is to describe the basic anatomy as well as the deformity. It follows that a thorough familiarity with the anatomic structures of the nose and those facial structures that relate to it is critical. For those surgeons who relate only to the nose and isolate it for evaluation, the overwhelming problem of the remaining facial complex is bypassed. However, those surgeons will probably never realize what they have missed from the workup or sacrificed from the potential results.

When examining the nose and its relationship to the face, one must consider a long, almost unending list of associated factors: age, sex, body type, facial contours, hair, lip support, dentition, malocclusion, facial deformities, symmetry, skin character, effects of contour changes, and a multitude of other factors. All of these have a dramatic effect on the initial evaluation, since the surgeon needs to be constantly thinking about the effect of the nasal anatomy and deformity and its relationship to the remaining facial parts. For example, decreasing nasal projection and upturning the tip on a patient who is over 6 feet tall is probably an error in most instances, as might be attempting a very minor cartilaginous manipulation for tip rotation in a thick, bulbous, oily nose.

Further complicating any analysis are the surgeon's individual artistic prejudices and the patient's desires. The decision as to what is the "ideal nose" for a particular patient becomes so complex that the "aesthetic sense", biased by the surgeon's past experiences and limitations, often determines the type of correction. The aesthetic sense method, although resulting in excellent results in some hands, may be difficult for the beginner, the intermediate, or even some experienced surgeons. Using this method may make improving on the basic technique difficult and thus make learning from past cases more difficult.

Many articles have been written on nasal evaluation, but the majority have been too general to be of significant value. The problem is that most nasal evaluation methods have been described without an attempt to relate them adequately to the remaining facial structures. To make sense of this task, the surgeon should consider breaking the evaluation into small steps. The originator of modern rhinoplasty, Jacques Joseph, analyzed every step individually in his rhinoplastic procedures (Aufrecht, 1969). That fact is an indication of the importance he placed on a method approach to rhinoplasty. This chapter is concerned with evaluation of the nose from multiple perspectives. Only when the description of the nose and its deformity is complete can one include the remaining modifying facial structures, such as the forehead, eyes, lips, and chin.

From this background a significant step will have been made preoperatively and postoperatively in advancing to the next level of finesse in rhinoplastic procedures, thus moving toward a goal of more predictable, consistent, and favorable results.

### **Nasal Anatomy**

Knowledge of the structural anatomy of the nose, as mentioned earlier, is a prerequisite to planning surgery for that area. For example, one must appreciate the different thickness of skin and soft tissue along the nasal dorsum (that is, the soft tissues increase in thickness in the nasion region and then thin across the rhinion to become thicker toward the tip). This basic anatomic fact, although not seen from examining the patient externally, is of profound importance during the surgical procedure, since the effects of healing must be anticipated when one is performing a rhinoplasty. The bony, cartilaginous, soft tissue, neural, and vascular aspects of the nose are well outlined in other chapters and are not discussed here. Nor does this chapter cover the functional effects of the surgical procedure that will be used.

One significant problem to overcome when studying anatomy is that of terminology. The literature is somewhat confusing and contradictory regarding nasal terminology. A thorough command of descriptive vocabulary is helpful. The sections that follow describe anatomic terms, including lines and angles, as they relate to the nose and face. One might draw the analogy that having this basic understanding of anatomy and terminology before performing a surgical procedure is much like understanding the moves and terms in a chess game before beginning play. The more one understands the basics, the better able one is to think ahead and make moves that will result in a more favorable outcome. For this reason, the reader is referred to the glossary of terms at the end of this chapter.

### **Documentation Techniques in Nasal Assessment**

To assist in the analysis and documentation of nasal contours, techniques using dimensional assessments can be extremely valuable. This value, of course, plays a role before, during, and after surgery, especially when long-term follow-up is desired. The standard at present in most offices is that of reproducible photography, since it is an excellent method of documentation and fairly easy to use. Many other methods are available, such as cephalometrics, facial moulages, xeroradiographs, selected measuring devices, and animated photography. All of these, however, seem to follow behind the standard photographic method.

The timing of presurgical documentation is fairly standard in that films are usually recent. However, the interval after surgery is basically at the discretion of the surgeon. The photographic postsurgical documentation is important because it allows the surgeon to assess short-term and long-term results. With frequent review of these films, the strengths and limitations of the surgeon's ability and/or of the particular technique can be further judged. Occasionally the surgeon may wish to review with the patient the documentation of the original or postoperative nasal contour. This review should help remind the patient of the previous deformity and the results achieved.

## **Photography**

Standardized views and distances taken with a good-quality 35 mm single lens-reflex camera with a 100 mm lens seem to be the most reliable choice in photographic documentation. The obvious limitations on reproduction are discussed in the literature (Farkas et al, 1980; Krugman, 1981; Krugman et al, 1979).

The accepted standard views for nasal contours are full-face frontal, right and left lateral, and base views of the nose. A lateral view with the patient smiling is an important aspect of record taking in that this animation will frequently unmask a significant tip ptosis of the nose resulting from the action of the depressor septi, nasal, and zygomatic muscles (Becker, 1956; Brown, 1951). Some surgeons also take right and left lateral oblique views. The films should be of the highest quality, with standardized, reproducible views, distances, and exposure settings. Multiple methods of establishing these standards include using the soft tissue Frankfort horizontal plane (Tweed, 1946), the natural head position (Moorrees and Kean, 1958), or selected head holders.

From the photographic documentation the surgeon can draw lines, measurements, and angles on the photographs and make tracings using thin acetate tracing paper. Many methods of using the tracings of photographs have been advocated. These include cutting the actual photograph, using different-colored pens or pencils, and cutting and projecting the acetate paper to rearrange the nasal and/or other structures of the face for a more harmonious balance. No magic lines, angles, or absolute rules can be assigned to any one patient to produce an ideal result. Therefore emphasizing that these studies are solely adjunctive is important.

## **Cephalometrics**

Cephalometric analysis has long been used primarily for assessment of the bony structures of the face. Orthodontists and oromaxillofacial surgeons (Bowker and Meredith, 1959; Hambleton, 1964; Legan and Burnstone, 1980) have advocated using this film for soft tissue emphasis as well. If properly taken, an oriented lateral skull film (cephalometric film) in the natural head position will show the soft tissue profile and also document bony abnormalities of the nose or other structures of the face. The literature is replete with methods of analysis using these films (Burnstone et al, 1978; Khouw et al, 1970; MacIntosh, 1970; Steiner, 1953, 1959, 1962). The benefit of using cephalometrics is that the image is lifelike, and the film, if taken with an oriented technique (a standard method with a reproducible head holder), is reproducible. This film provides an excellent view of the profile. However, its use in planning nasal corrections is limited if one is not planning to change the bony structure of the remaining face, since the same amount of useful information can be obtained from a lateral photograph. A photograph, of course, is also much easier to obtain and does not expose the patient to the difficulty and expense of radiographic films.

## **Facial moulages**

A facial mask of plaster, plastic, or wax is a three-dimensional documentation of the nose and other facial structures. It can certainly be of value in documenting nasal contours. However, its usefulness for other facial contours is limited unless a significant asymmetry exists. The time and effort necessary to obtain a facial mask are too great to be justified for nasal evaluation in most instances.

## **Xeroradiographs**

A xeroradiograph is much like the lateral cephalometric skull film, and xeroradiograph can actually be traced over like a cephalometric analysis. This method provides a more distinct outline of the soft tissue and bony structures (McKinney and Miller, 1974). However, the equipment is scarce and expensive and hence seldom used for aesthetic purposes.

## **Selected measuring devices**

General anthropomorphic measurements and many other similar methods have been used to qualitate and quantitate nasal shape and size. Historically these methods are interesting and informative, and a tremendous amount of baseline information can be obtained by using them.

Providing detailed information about the various available measuring devices is beyond the scope of this chapter. The interested reader is referred to the following sources:

Calipers (Farkas and Cheung, 1979; Farkas and Lindsay, 1971; Lindsay and Farkas, 1972)  
Rhinometers (Berson, 1944)  
The Golden Divider (Ricketts, 1982)  
Photometry (Becker, 1956; Denecke and Meyer, 1967)  
Profilometry (Brown and McDowell, 1951; Safian, 1935; Seltzer, 1949).

## **Berson rhinometer**

Berson first published his methods of nasal evaluation in 1943, but Joseph actually first described the technique. This was an attempt to determine the exact amount of tissue to be removed at surgery and to reassure the patient that an organized approach could be developed concerning his case. In 1982 Ricketts, an orthodontist, introduced a special caliper, The Golden Divider. This divider could be used on any facial structure, and the proportional method then applied. Called "The Golden Section" or "Divine Proportion", this method related beauty and mathematics.

## **Animated photography**

Video cameras with tape or motion-picture cameras with film can be used in patient evaluation and are especially valuable for the animation aspects of documentation. Elaborate

methods, such as rotating chairs that are timed in sequence to the photographic equipment, have been devised and are presently being used. The video camera system appears to be a more realistic method of documentation at present than film and may be a useful tool for preoperative and postoperative patient counseling.

Undoubtedly, during the reader's career many methods of analysis, including photographs, cephalometrics, and measuring devices, will be examined, used, thrown out, modified, and maybe even adopted as standard practice.

### **Measurements of the Nasal Complex and Proportions of the Face and Nose**

The ideal nose, like the ideal face, is a difficult concept to describe. Much of the material presented has been covered in the text *Proportions of the Aesthetic Face* (Powell and Humphreys, 1984). Many methods of evaluation for the forehead, eyes, nose, lips, chin, and neck are detailed there.

As one critically examines the nose, one appreciates a feeling of proportion and balance with the rest of the face. In an attempt to supplement the visual examination, methods using lines, angles, and distances can be applied to photographs or radiographs, thus better quantifying the baseline workup. It should be readily apparent that this method of using measurements, lines, or angles is not easily transferred to the patient during surgery (Bernstein, 1975a, 1975b, 1975c). Seltzer (1949) suggests that little point exists in using precise nasal measurements since the remaining lines of the face, and indeed the entire face, are not completely symmetric. As with any nasal correction, all the remaining structures of the face should be considered. In addition, the evaluation should correlate the age, sex, body type, and the patient's desires with the nasal contour in order to synthesize the most favorable corrective treatment plan. Actually, no single facet of the workup should be so important that it alone could not be excluded. Although an overwhelming emphasis is placed on the face in profile for nasal evaluations, an awareness of full-face proportions should always be included. Several authors have effectively discussed this fact, but they have focused their study more on chin contours than on nasal contours (Gonzalez-Ulloa, 1961, 1962; Gonzalez-Ulloa and Stevens, 1968; Holh and Epker, 1976; Millard, 1965; Pitanguy, 1968; Rish, 1955, 1962, 1964; Simons and Lawson, 1975; Tresley et al, 1972).

### **The thirds of the face**

Facial measurements, whether taken full face or laterally, traditionally have been divided into upper, middle, and lower thirds. Basically, two methods of division exist, neither of which is ideal for nasal analysis, since neither uses a measurement from the nasion, or root of the nose, to the tip; instead, both use a measurement from the root of the nose to the subnasale.

One method of dividing the face is from the trichion, the junction of the forehead and hairline in the midline, to the glabella, the most anterior projecting point of the forehead. This division delineates the upper third of the face. The middle third is measured from the glabella to the subnasale. The lower third is measured from the subnasale to the menton (Fig. 38-1). The

accepted aesthetic ratio in this analysis is that of equal thirds. The difficulty with this method is that the length of the nose is described from the glabella to the subnasale, which may correlate with the idea of thirds; however, when this length is used in proportion for other nasal measurements, it may bias and confuse the results. An example of the problem is seen with the anthropologic measurement of nasal index used in assessing racial characteristics. This nasal index is equal to the width of the nose divided by the length of the nose times 100. The obvious problem with this index is that most authors who refer to it do not describe how they determined the length of the nose; that is, was the measurement from the glabella or from the nasion, to the tip or to the subnasale? To solve this dilemma, the examiner needs to establish a set of anatomic points and thus provide consistency between preoperative and postoperative studies.

A second method of describing proportions of the face uses a slightly lower landmark, that of the nasion. This method disregards the forehead height, since it is so variable because of secondary changes in the hairline position. A ration then exists between the middle and lower portions of the face and may be described as follows. The middle portion of the face is measured from the nasion to the subnasale, and a measurement is taken from the subnasale to the menton. The total measurement is from the nasion to the menton. This proportion should be approximately 43% for the nasion-to-subnasale length and 57% for the subnasale-to-menton length as related to the total length from the nasion to the menton (Fig. 38-2). This nasal measurement is more acceptable in that it begins at the root, or radix, of the nose. The lower measurement using the subnasale is not quite as useful as a measurement of the tip would be, since the dorsal length of the nose (from nasion to tip) is frequently modified during surgical manipulation.

### **Midline**

Midline asymmetry is basically assessed from a full-face frontal view with a line through the forehead, nasal tip, lips, and chin, or specifically from the trichion through the nasal tip and then through the subnasale and pogonion (Fig. 38-3). This assumes that no other major facial asymmetries exist. Major asymmetries are easily recognized without drawing lines, but certain subtle nasal deviations are more difficult to assess if some method is not used. Transparent protractors have been used. The twisted nose such as the C- or S-shaped deformity is well outlined for review in general texts.

### **Frankfort horizontal plane**

A traditional line of reference is a line drawn from the upper aspect of the tragus to the inferior orbital rim while the patient is in a standard head position (that is, the eyes parallel to the floor) (Fig. 38-4). The Frankfort horizontal plane (Tweed, 1946), although well described and used by many authors, is a very difficult line to reproduce in practice. To sit down with a cephalometric lateral head film and draw a line from the external auditory canal to the infraorbital rim is not easy. This technique is even more difficult to reproduce when it is applied to the soft tissues, as in a photograph. Even though the tragus is easily seen, assessing the exact infraorbital rim location accurately on photograph after photograph is almost impossible. Therefore the Frankfort horizontal plane should be considered as a standard of reference only so

long as one appreciates its limited reproducibility.

### **Lines and angles**

When the surgeon attempts to quantitate the normal or average nose and angular measurements represent a data base. An appreciation of their interplay will increase the surgeon's awareness of existing nasal contours and their potential for change. No doubt, evaluating the contour of the nose is almost impossible without also assessing one of the major masses of the face, the chin. Approximately 15% to 20% (Millard, 1965; Simons and Lawson, 1975) of patients who undergo rhinoplastic procedures could benefit from either augmentation or reduction of the chin. This fact has previously been recognized, and probably more literature has been written concerning chin proportion as it relates to the nose than its relationship to any other part of the face. This aspect comes largely under the evaluation of what has been termed *profileplasty* (Gonzalez-Ulloa, 1961, 1962; Gonzalez-Ulloa and Stevens, 1968). This chapter only briefly discusses movements of other structures in the face and their relationship to the nasal complex, since the concern here is with nasal contours, size, and shape. Interestingly, however, a harmonious and well-balanced facial profile, whether it be male or female, is usually reflected on the full-face view as well. The reverse is not true, however, in that the patient with a very acceptable full-face view may not demonstrate proper proportion on lateral views. The most significant area of deformity on a profile view is usually the nasal complex, followed in frequency by the chin.

Useful nasal lines and angles can be measured by following the guidelines listed below.

#### ***Nasofrontal angle***

The nasofrontal angle (Krugman, 1981; Powell and Humphreys, 1984) is found by drawing a line tangent to the glabella through the nasion that will intersect a line drawn tangent to the nasal dorsum (Fig. 38-5). Angles in an aesthetically pleasing profile average from 125 to 135 degrees. The actual angle can be modified to give the illusion of a shorter (deepened angle) or longer nose (opened angle), since surgical manipulation can deepen or fill the angle or shift its vertex from 6 to 8 mm superiorly or inferiorly.

#### ***Nasofacial angle***

The nasofacial angle is measured from a vertical line drawn tangent to the forehead at the glabella and tangent to the chin at the pogonion so that a line drawn along the nasal dorsum intersects it. The particular angle formed is of major significance because it is used as one method to assess the projection of the nose (Fig. 38-6) (Denecke and Meyer, 1967; Powell and Humphreys, 1984; Safian, 1935; Seltzer, 1949; Sheehan, 1936).

### *Nasomental angle*

The nasomental angle is described by a line drawn through the nasal dorsum intersecting a line drawn from the nasal tip to the soft tissue at the pogonion (Powell and Humphreys, 1984). This angle correlates with the tip projection, chin, and forehead (Fig. 38-7).

### *Nasomental line*

The nasomental line (Powell and Humphreys, 1984) is a line drawn from the nasal tip to the soft tissue chin at the pogonion and can be considered the lipline. This line is placed closer to the lip or further away, depending on the nasal projection and/or chin projection or retrusion. The interplay between the nasomental line, nasofacial angle, and nasomental angle is an important factor in facial balance, since it relates the nose, forehead, lips, and chin (Fig. 38-8).

### *Nasolabial angle*

The nasolabial angle is the angular inclination of the columella as it blends with the upper lip. The angle is created from a line that lies along the most anterior point of the columella and runs to the subnasale and from a line that intersects the subnasale, tangent to the mucocutaneous border of the upper lip (Fig. 38-9). A dental or skeletal deformity, whether in the maxilla or in the mandible, can have a significant impact on this angle. A very prominent or deficient anterior nasal spine will also influence the curvature of this angle. A nasolabial angle in the range of 90 to 120 degrees is considered aesthetic (Aufrecht, 1969; Bernstein, 1975b; Brown and McDowell, 1951; Denecke and Meyer, 1967; Wrigth, 1975). The male nose usually shows a measurement at the more acute end of the range, whereas the female measurement is generally more obtuse. This measurement is so standard that its assessment can be found in most texts on facial aesthetic surgery. Care in assessing the lateral photograph of the patient at rest and smiling will reveal an occasional change in this angular measurement. This change is seen as the tip is pulled down on smiling, thus affecting the nasolabial angle. When present, this factor needs to be considered before surgery. Variability of upper lip length and columellar length also influences this angle. Burstone (1967), an orthodontist, provided an excellent review of lip position as it relates to the midface and lower face.

### *Columellar-alar angle*

The columellar-alar angle is drawn with its vertex at the base of the columella and the lateral lines tangent to the caudal ala (Ashton and Guy, 1977). Aesthetically, the columella should be slightly lower and parallel to the ala when viewed in any direction. The columella, when viewed on full face, has a "gull-in-flight" appearance (Fig. 38-10) (Rees, 1980; Sheen, 1975). The preferred range for the columellar-alar angle has not been defined.



### *Nasal index*

The nasal index (Rees, 1980; Seltzer, 1949) was used to signify and classify racial nasal characteristics. The equation for the index is width/length times 100. In the white population such an index would average approximately 70, whereas in the black population indexes might range from 85 to 90, reflecting the wider alar base widths. As noted earlier, few of the articles reviewing the nasal index describe which landmarks were used in measuring nasal length. Farkas and Lindsay (1971) measured the length of the nose with a caliper between the nasion and the base of the columella. They stated the width of the nose to be the diameter as measured in the widest part of the caudal nose. It, too, was measured with a caliper.

### *Tip projection and rotation*

Two specific measurements or illusions of measurement go hand in hand: that of tip rotation and that of tip projection. The understanding of one is required for the understanding of the other.

**Tip rotation.** Simons (1982) probably best delineated these two when he used a nose enclosed within a half circle and radius to differentiate between actual tip projection and rotation. In tip rotation the radius line moves upward or downward as the tip is raised or lowered (Fig. 38-11). An illusion of tip rotation may be gained by decreasing the height of the nasal dorsum.

**Tip projection.** Tip projection is the actual distance that the nasal tip projects from the face at a designated location (that is, alar groove to nasal tip). Greater lip projection increases the length of the radius line (Fig. 38-11), and lesser projection shortens it. Joseph's profile, or nasofacial, angle (Seltzer, 1949) also assesses the degree of projection as it relates to the facial plane (a line from the glabella to the pogonion).

In quantitating nasal projection, one may use a specific angle or a ratio of horizontal-to-vertical distances. The nasofacial angle, as previously described, is of particular importance because it is the major angle used to assess projection of the nose (see Fig. 38-6).

Note: If a hump deformity is present, it should be transected by the dorsal line (Aufrecht, 1969; Brown and McDowell, 1951). From a review of the literature, it appears that the preferred nasofacial angle is 36 to 40 degrees. The female profile should be at the lower end of this range and the male profile at the upper end.

Having more than one method of assessment is always helpful, and a measurement other than an angular one is useful to supplement the workup (Powell and Humphreys, 1984; Simons, 1982). Goode's method, which follows, is presented to fill that need. The nasal projection is approximately equal to the length of the upper lip; hence, this ratio should be 1:1. The lip is measured from the mucocutaneous border to the base of the columella at the subnasale. The measurement of nasal projection is from the subnasale to the nasal tip. Goode's method uses a vertical line drawn from the nasion to the alar groove. This is the reference line. A horizontal line

is then drawn from the nasal tip perpendicular to this vertical reference line. Then a line is drawn from the nasion to the nasal tip. A ratio comparing the length of the horizontal base line (ala to tip, or A-T) with that of the dorsal line (nasion to tip, or N-T) is made. The equation is as follows:

$$\mathbf{A-T/N-T = 0.55 \text{ to } 0.60}$$

This ratio of base to dorsum reflects an increase or decrease in projection. The lower figure of 0.55 is more consistent with a female nasal projection, and the upper limit of 0.60 is more consistent with a male nasal projection. Interestingly, when these suggested ratios are observed, the nasofacial angle approximates that of 36 degrees (Fig. 38-12). By the use of this method, one can assess nasal projection via angular and proportional measurements.

### **Nasal Length, Width, and Columellar-Alar-Lobular Complex**

#### **Nasal length**

Using the nasofacial angle method, the surgeon measures the nasal length along the dorsal line on a full-face or lateral view, or as it relates to tip projection. Methods of nasal measurement for this type of analysis are described earlier in this chapter. Relating the length of the nose to changes in rotation and projection and to actual shortening or lengthening of the nose is important. Seltzer (1949) presented methods of relating nasal length to other nasal proportions. One method he described correlates the forehead and lower lip with nasal length. He summarized that the forehead, the nose, and the distance from the nose to the lower lip should all be equal or only slightly variable in length. The problem with this method is the lack of a specific point of reference. A second method relates the nose to the ears and suggests that the length from the root of the nose to its base should be equal to that of the length of the ears. An effective method for evaluating nasal length along with nasal projection is Goode's method combined with Joseph's method of angular measurements (Powell and Humphreys, 1984). As described above, Goode's method uses a ratio derived from the ala-to-tip measurement divided by the nasion-to-tip length, which should fall within a range of 0.55 to 0.60. This method not only considers the dorsal measurement as seen in profile, but also the measurement of nasal projection from ala to tip. As described above, this method rather accurately describes projection, and the ratio range as stated is consistent with a nasofacial angle of approximately 30 to 36 degrees.

Dorsal deformities as viewed in profile are described with many cryptic terms, such as "saddle deformity", "polybeak deformity", and "hump deformity". Some of these terms are found in line drawings in the works by Denecke and Meyer (1967) and Sheehan (1936). The reader is referred to these excellent references for specific definitions.

#### **Nasal width**

Nasal widths are measured from the frontal projection and the basal view. The frontal view is discussed first. Selected methods of analysis are presented. The first method describes

the width (base) as measured from the most lateral portion of the ala to the opposite most lateral point of the ala. This should be approximately 70% of the length as measured from the nasion to the nasal tip (Fig. 38-13). The second method relates the width of the nasal base to the distance between the inner canthi of the eyes. The two should be approximately equal (Bernstein, 1975b; Denecke and Meyer, 1967; Krugman, 1981; Wright, 1975). Expressed differently, the nasal base is approximately one eye in width. This relates to the rule of fifths that states in part that there are five average eye widths across the face (Becker, 1956).

According to Albrecht Dürer and Leonardo da Vinci, if lines are drawn from the inner canthus of the eye vertically down the face, the ala should be tangent to this line in a well-proportioned nasal base.

The remaining nasal width measurement, that of the base view, is also important in nasal evaluation. Bernstein (1975b) has described the nasal base as being ideal when it is circumscribed by an equilateral triangle with the columella at its centermost portion (Fig. 38-14).

### **Nares**

On frontal view, the nares should barely be visible while the head is in the natural head position. As mentioned earlier, Sheen (1978) has described the gull-in-flight contour (see Fig. 38-10). The columella should be slightly lower than the line parallel to the ala when viewed in any direction (Ashton and Guy, 1977; Sheen, 1975).

### **Columella**

The columella is divided into three segments: the anterior lobular portion, the intermediate (or narrower) portion, and the basal (or wider) portion). Each segment is approximately equal in length. The width of the lobular portion of the columella (that is, the upper third) should be approximately 75% of the basal width as measured from lateral ala to lateral ala (Fig. 38-15). The nares contour should be somewhat asymmetric and ovoid with a base along the nasal sill. The long axis of the nares should be approximately 45 to 60 degrees from the midline in the nose of a white person, but is more horizontal in orientation in the nose of a black person.

### **Columellar-alar-lobular complex**

The columella, ala, and lobule are described earlier in this chapter and now are included as an aesthetic complex for evaluation. The interplay within this complex has a significant impact on the aesthetic impression. The columellar-alar-lobular complex is best viewed from a profile position. One can normally see the columellar line below the alar line in profile, though the distance between the two lines should not be more than 3 to 5 mm (Fig. 38-16). Also, on this view the nares should have an oval or half-moon shape. The alar volume/lobular volume ratio existing in the aesthetic profile is considered optimal at 1:1. Varying this ratio gives an unbalanced appearance. An excess in the lobular portion appears to be more acceptable than one in the alar region (Fig. 38-17) (Bernstein, 1975b). This ratio may be affected by any nasal tip

surgery, a fact that one should appreciate when planning surgery in that region.

### **Supratip break**

The supratip break is also described as the supralobular depression and is a depression just cephalic to the nasal tip where the lobule meets the dorsal portion at the middle cartilaginous vault. This very subtle break is considered extremely aesthetic in the nasal profile and is more pronounced in the female face than in the male face.

### **Columellar double break**

The double break of the columella is described by the following. The tip of the nose is the leading point of the profile, and it should curve gently into the columella. The first curve should be slightly convex and extend from the nasal tip toward the lobular columella. Then the columella at its midportion curves convexly to drop off below (inferiorly) toward the base of the columella at the subnasale. A suggestion of two distinct curving planes exists: superiorly, from the tip to the lobular columella and then to the columellar point, and inferiorly, continuing toward the columellar base at the subnasale (Fig. 38-18). These curving planes and the resultant contours are extremely difficult to reproduce surgically, even in the best of hands. The recognition of their aesthetic importance should stimulate caution during a surgical procedure in that region so that the double break can be created, or maintained should it exist preoperatively.

### **The Aesthetic Triangle**

In the soft tissue analysis of the aesthetic triangle, the nose is the major component, and the other facial structures that modify its aesthetic appearance are included for an overall facial evaluation. Any lateral facial photograph, 35 mm slide, or lateral skull film of soft tissue is an acceptable model for tracing. This technique uses angles and relative proportions of the facial complex. By so doing, even non-standardized lateral skull films or photographs can be compared. The triangle relates the major aesthetic masses of the face (that is, forehead, nose, lips, chin, and neck) to each other and does so with simplicity. Much like a cephalometric tracing with its stable reference point (the cranial base), the triangle uses a relatively stable base - the forehead. The analysis then works downward sequentially, analyzing the nose, lips, chin, and neck. As one moves downward from the forehead, the ease of surgical modification varies from the most difficult (forehead) to the least difficult (chin).

### **Measurements**

All the major masses are interdependent and for diagnostic purposes should be considered as a whole; hence, after breaking down each part into individual sections for analysis, the surgeon should combine them at the end for the synthesis of that patient's ideal facial aesthetic balance and harmony. The aesthetic triangle analysis relates aesthetic balance of the face using soft tissue angles and lines. The surgeon uses two facial angles previously described and two original angles and a line for the final analysis. They are as follows:

Nasofrontal angle  
Nasofacial angle  
Nasomental angle  
Mentocervical angle  
Nasomental line.

All angles and lines are individually evaluated first. They are then viewed as a whole. Occasionally abnormalities in balance can be seen even when the individual angles are in the normal range of aesthetics. To use the triangle fully for preoperative diagnosis and predictions as well as postoperative evaluation, the surgeon should fully understand an analysis of the important parts. Two major interdependent angles and one major line are evaluated: the nasofacial angle, the nasomental angle, and the nasomental line. For example, in a patient with deficient nasal projection, the nasofacial angle is more acute. To assess the effects of increasing the nasal projection, one increases the nasofacial angle on tracing paper. The results of this change are reflected in an illusion that the chin's position is less prominent, since this adjustment causes the nasomental angle to become more acute. This inverse relationship can be fine-tuned by the third parameter, the nasomental line. With adjustments of the nasofacial and nasomental angles that allow the lips to fall close to the nasomental line, a balance in facial structures will exist for that patient. The remaining adjustments can be made at the nasofrontal or mentocervical angle as necessary.

The manipulation of these angles and lines will give the surgeon an insight into the interdependency of the individual parts. This understanding should carry over into the surgical procedure and improve the postoperative result. Results can be assessed postoperatively by a review of the original workup and prediction tracings. This feedback will be invaluable in future diagnosis and planning, since it will soon identify the strengths and limitations of respective surgical corrections.

This method is not intended to displace or substitute for a cephalometric workup for those patients with significant skeletal facial deformities. If needed, a full cephalometric workup is done with the anticipated projection tracings, and then the aesthetic triangle is applied to the final expected results. I have established ideal ranges using tracings from models, celebrities, and fashion models as illustrative of our concept of beauty. One only has to use the larger numbers for the more prominent masculine features (for example, more nasal projection would be consistent with a nasofacial angle closer to 40 degrees). Bernstein (1975b) has also outlined the differences in male and female nasal contours.

#### **Ideal ranges for men**

Nasofrontal	115 to 130 degrees
Nasofacial	30 to 40 degrees
Nasomental	120 to 132 degrees
Mentocervical	80 to 95 degrees.

The technique and tracing steps of the aesthetic triangle concept are as follows:

1. Drop a vertical line from the glabella (the most prominent point in the midsagittal plane of the forehead) to the pogonion (the most prominent point of the chin) (Fig. 38-19). This line establishes the vertical anterior facial plane. If the line does not look relatively vertical, it can be checked with reference to the Frankfort horizontal plane. This angle should be in the range of 80 to 95 degrees.

2. Next, draw a line tangent to the glabella through the nasion (the deepest depression at the root of the nose), which will intersect a line drawn tangent to the nasal dorsum (Fig. 38-19). This nasofrontal angle should be in the range of 115 to 130 degrees. Remember that should a hump deformity exist, it should be transected by the straight line from the tip to the nasion.

3. Measure the nasofacial angle from the lines drawn in the first two steps. Ideally, the angle should be in the range of 30 to 40 degrees.

4. Draw a line from the nasal tip to the pogonion (the nasomental line) (Fig. 38-19). This line creates the major angle of the aesthetic triangle, the nasomental angle, which should be 120 to 132 degrees. This angle is the one formed by the nasal dorsal line with the nasomental line. Once the proposed nasal projection has been established by adjusting the nasofacial angle, the nasomental angle will define the relationship of the lips and chin to the upper face and mid-face. One will readily see that alterations of nasal projection or chin prominence will affect the position of the lips in relationship to the nasomental line. The nasomental line can be used to balance the nasal projection with the mental cervical contours and lips. The lips should fall just behind this nasomental line, with the upper lip approximately twice the distance from the line as that of the lower lip when the nasofacial and nasomental angles are optimal.

By this interplay and manipulation of the angles, one can construct an aesthetically pleasing profile that is in harmony with the rest of the face. The analysis can also be used when there are minor skeletal deformities and malocclusion.

The nasolabial angle is not included in the triangle, since it traditionally has been easy to evaluate and relates to nasal projection and lip position, which are already assessed in the triangle analysis.

## Glossary

This review limits itself to the external aesthetic components. The nature of the terms used is both anatomic and conceptual. A thorough grasp of both is necessary to understand the individual components of the nose and then relate this knowledge to other structures of the face. For simplicity, only the most commonly used terms and conceptual descriptions are presented. Clearly, a complex and lengthy list of surgical terms could also be given. For example, terms such as *struts*, *retrograde dissection*, *complete rim strip*, *lateral crural flap*, *transfixion*, *hemitransfixion*, *alar notching*, and *pollybeak* are in common use (Bernstein, 1974, 1975a, 1975c;

McCollough and Mangat, 1981).

The following are reference terms with brief descriptions:

***ala*** The most lateral rim of the nostril, composed of cartilage and soft tissue (Fig. 38-20).

***alar groove*** The immediate fold lateral to the alar cartilage that separates the cartilaginous structure and skin from the nose and the cheek.

***anterior nasal spine*** The most anterior point of the premaxilla in the midsagittal plane. A bony landmark, it is included because it has such a dramatic effect on the nasolabial angle (Fig. 38-21).

***bony nasal pyramid*** The bony external portion of the nose, also termed the *bony vault*. This anatomic structure provides the structural base of the upper portion of the nose at the root and is formed by the frontal process of the maxilla and the nasal bones (Fig. 38-22).

***cartilaginous pyramid*** The cartilaginous portion of the external nose, which is further divided into the upper cartilaginous vault, or middle nasal vault, and the lower cartilaginous vault, or lower nasal vault (Fig. 38-22).

***cartilaginous vault: upper (middle nasal vault)*** Composed of the upper lateral cartilages that attach to the bony nasal pyramid, or upper nasal vault. Sheen (1984) has described the middle vault (upper cartilaginous vault) as the midsection of the nose that is slightly curved, with divergent lines that extend smoothly from the root of the nose to the tip (Fig. 38-22).

***cartilaginous vault: lower*** Considered the base of the nose and made up of the tissues distal to the upper lateral cartilages; is inclusive of all soft tissue, cartilage, and bone in that region (Fig. 38-22).

***caudal*** Inferior (Fig. 38-21).

***cephalic*** Superior (Fig. 38-21).

***columella*** Consists of the two medial crura of the lower lateral cartilages, soft tissue, and skin; is further broken down in thirds from the nasal tip to its base and includes the anterior lobule, or upper third; the midportion of the columella, called the *intermediate columella*, or middle third; and the base of the columella, or basal third (Fig. 38-20).

***dome*** Considered the portion of the tip that includes its cartilages. Bernstein (1974) has effectively described it as the anterior-most apex of each nasal vestibule. He has further described the domes in anatomic, clinical, surgical, and vestibular terms (Bernstein, 1975c) (Fig. 38-21).

***dorsum*** The anterior aspect of the nose; can be referred to as the anterior margin of the

nasal pyramid to include the bony and cartilaginous vault regions (Fig. 38-22).

**glabella** The most prominent point of the soft tissue, the forehead, and the midsagittal plane (Fig. 38-20).

**lobule** Considered to be the movable caudal third of the nose; no consistent definition exists today. Dingman and Natvig's (1977) reference to Cottle's description suggests that the lobule consists of the tip, ala, columella, and membranous septum (Fig. 38-21). No connection of bone or cartilage exists between the lobule and the rest of the nose. Aesthetically, one can see the convexity overlying the lower lateral cartilages with a demarcation at the supralobular region, defined as the *supratip depression*. Laterally the lobule extends to the crease of the ala. Caudally the margins are at the anterior projecting midpoint of the columella, and inferiorly at the base of the columella.

**menton** The most inferior soft tissue contour point of the chin (Fig. 38-23).

**nares** The caudal opening to the nose (Fig. 38-20).

**nasal pyramid** The nose divided into thirds. The upper one third is bony; the lower two thirds are cartilage (Fig. 38-22).

**nasal sill** The inferior aspect of the nares at the junction of the nasolabial angle and external nares opening (Fig. 38-21).

**nasion** The deepest depression at the root of the nose in the mid-sagittal plane (Fig. 38-20).

**nasolabial fold** A crease or fold between the cheek and alar cartilages running obliquely and laterally toward the commissure of the lips (Fig. 38-20).

**pogonion** The most anterior projecting point of the soft tissue chin (Fig. 38-23).

**radix** The superior aspect of the nose that is considered the root. It originates from the supraorbital ridge and nasion region and forms a continuous, smooth line caudally along the lateral nasal dorsum. The radix, or root, can also be considered the nasion (Fig. 38-20).

**rhinion** The junction of the bony and cartilaginous vaults. It usually forms the area considered the hump of the nose (Fig. 38-20).

**soft triangle** A membranous triangle of tissue in the lobule of the nose. It can be slightly flattened and has been described as being a facet. The location of the soft triangle is superior to the apex of the nose between the junction of the columella and ala. No cartilaginous support on the rim exists in that area (Fig. 38-21).



***subnasale*** The point at which the nasal columella merges with the upper cutaneous lip in the midsagittal plane (Fig. 38-20).

***supratip depression*** Also known as the supralobular depression. It is just cephalic to the tip where the lobule meets the upper lateral cartilages (Fig. 38-20).

***tip*** Considered the most anterior projecting point of the nose, or the leading point in a profile view (Sheen, 1975) (Fig. 38-20).

***trichion*** Found at the midsagittal plane, in the forehead at the hairline.