CHAPTER 5 Basic Facial Analysis

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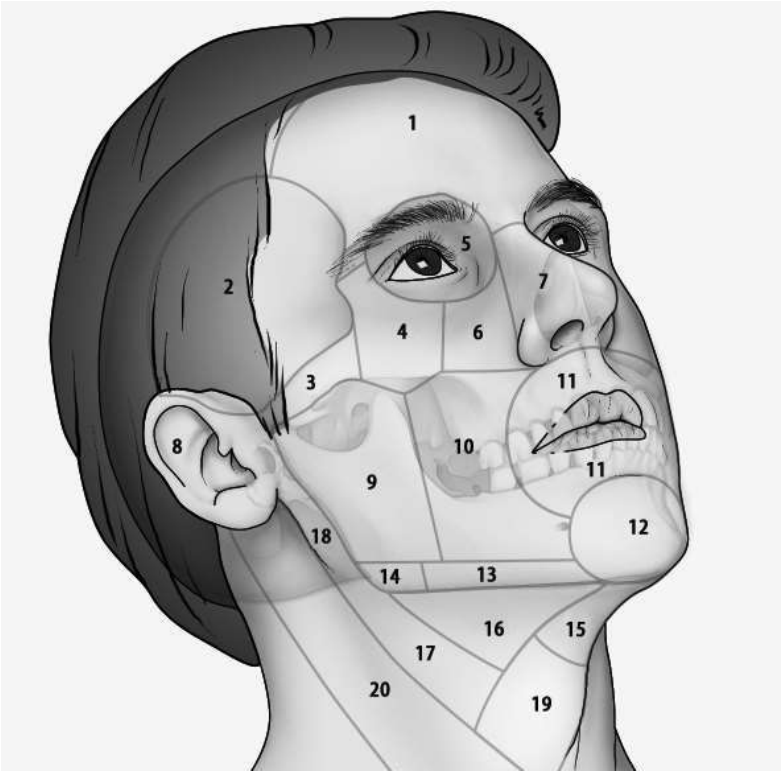


Fig. 5.1. Regions of the face and neck: *1* forehead region, *2* temporal region, *3* zygomatic arch, *4* malar region, *5* orbital region, *6* infraorbital region, *7* nasal region, *8* external ear, *9* parotid-masseteric region, *10* buccal region, *11* oral region, *12* chin region, *13* mandibular border region, *14* mandibular angle region, *15* suprahyoid region, *16* submandibular triangle, *17* carotid triangle, *18* retromandibular fossa, *19* median cervical region, *20* sternocleidomastoid region

During the first session with a new patient, the analysis and discussion are often focused on a particular facial feature, such as "the nasal hump," "the crowded upper anterior teeth," or "the periorbital wrinkles." This is related to a common idea among patients that there is only one single major problem, which needs treatment, and many minor or "not-detected" details, which are entirely acceptable. I favor this initial approach in every case, writing an itemized list of the patient's concerns to reassure her about my understanding of her wishes.

Even if I confirm the patient's concerns, a basic analysis of the entire face must be done next in order to separate the problem into its absolute and relative values.

For example, in the case of a large nose, what is the role of the nose itself and what is the role of a deficient paranasal region, a total hypoplasic maxilla or a flat lower lip-chin profile?

5.1 Regions of the Face and Neck

The surface of the face and neck can be divided into basic regions or frames as follows [6]:

1. Forehead region
2. Temporal region
3. Zygomatic arch
4. Malar region
5. Orbital region
6. Infraorbital region
7. Nasal region
8. External ear
9. Parotid-masseteric region
10. Buccal region
11. Oral region
12. Chin region
13. Mandibular border region
14. Mandibular angle region
15. Suprahyoid region
16. Submandibular triangle
17. Carotid triangle
18. Retromandibular fossa
19. Median cervical region
20. Sternocleidomastoid region

The landmarks of these anatomical regions are not always obvious, as depicted in Fig. 5.1.

5.2 Basic Qualitative Facial Analysis (Without Measurements)

The preliminary analysis – the most important – of a clinical case first requires exploring some basic facial features without taking any metric or angular measurements. These quantitative measurements are frequently at variance with each other: the same nasal tip can be 2 mm under-projected utilizing the norms proposed by Doctor JX, 1 mm under-projected utilizing the parameters of Doctor JJ or normal utilizing the data of Doctor JK! Furthermore, are the subject's sex, age, height, weight, race, hormonal balance, head positioning and many other variables all taken into account in these normative data? I think not.

So, a general assessment must be created without comparing it to normative values or a given template but using

only adjectives and referring them to the whole face and to the main facial subunits, lines and points. Some of the most utilized adjectives are: normal, symmetric-asymmetric, present-absent, long-short, large-small, wide-narrow, deep-shallow, convex-concave, full-hollow, open-closed, acute-obtuse, straight-curved, projected-depressed, balanced-unbalanced, deviated-centered.

A particular effort is made to recognize which areas are in an ideal position and/or have a normal shape and volume, as they will be used in evaluating and comparing the other regions.

5.2.1 Frontal View Analysis

Frontal analysis starts by assessing the transverse and vertical facial dimensions and general symmetry. The relationship between the bitemporal, bizygomatic, bigonial, and mental widths, also in comparison with facial heights, determines the facial form, which varies from wide to narrow, from long to short and from square to triangular (Fig. 5.2). The grade of angularity and skeletonization of the facial form should also be noted.

Symmetry is always checked. Many patients are unaware of minor facial asymmetries and if they discover these in the postoperative period, it will lead to patient dissatisfaction and misunderstanding. My preferred way to document and show all the facial asymmetries to the patient requires the marking of the midline skin points, using a fine-tip surgical skin marker and taking the frontal, basal and face-down views again (Fig. 5.3). If the facial asymmetry is located in a lateral structure and not in the midline, as in the case of unilateral upper lid ptosis, a simple picture taken in frontal view is the best way to communicate this to the patient.

My attention is almost always focused on the central oval of the face. This extended facial region, described by Oscar Ramirez in his articles on facial rejuvenation, is also of interest in every basic facial analysis [7]. The central oval of the face comprises the eyes, the eyebrows, the zygoma, the nose, the mouth and the chin, as depicted in Fig. 5.4.

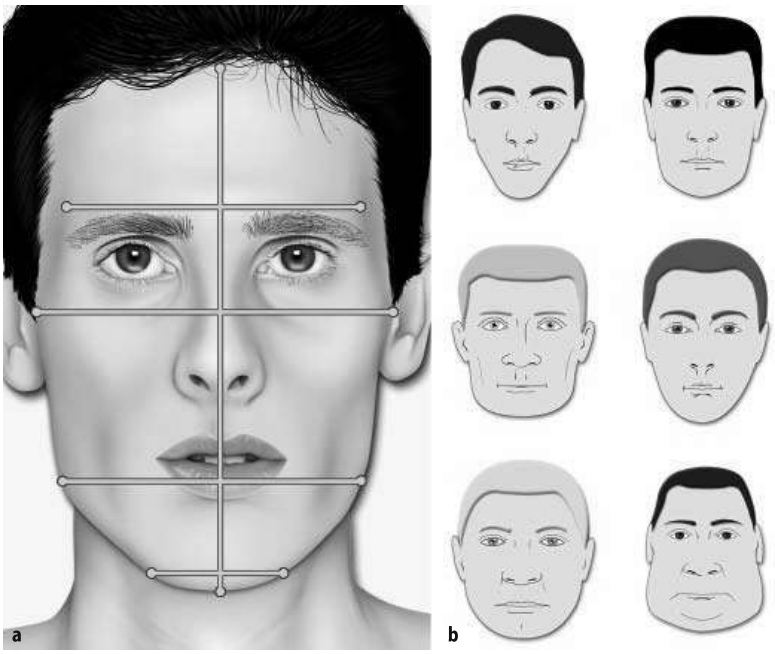


Fig. 5.2. ▲ The bitemporal, bizygomatic, bigonial, and mental widths, and the total facial height (**a**). Examples of differences in facial form obtained by varying the width of the face at different levels (**b**)

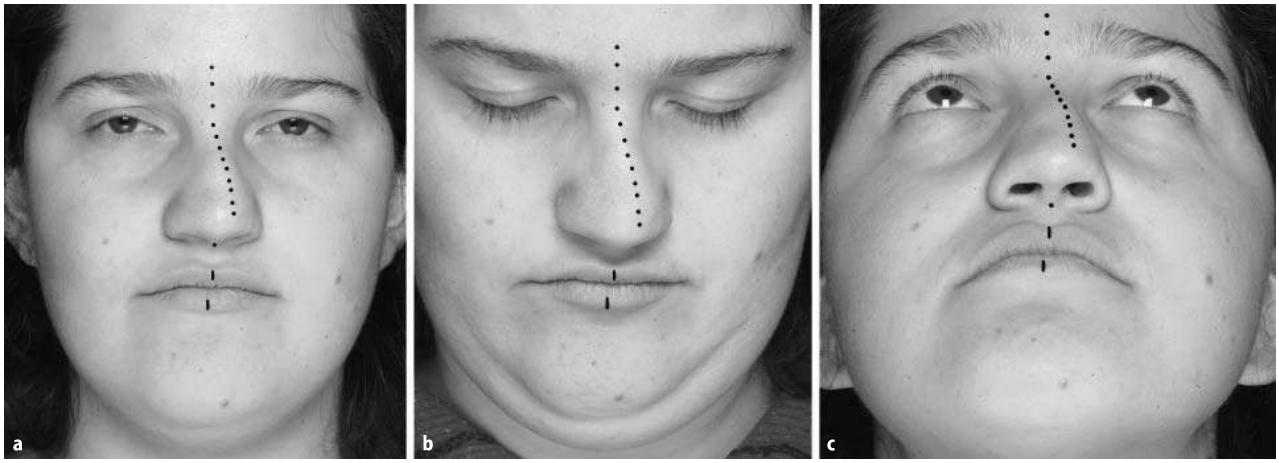
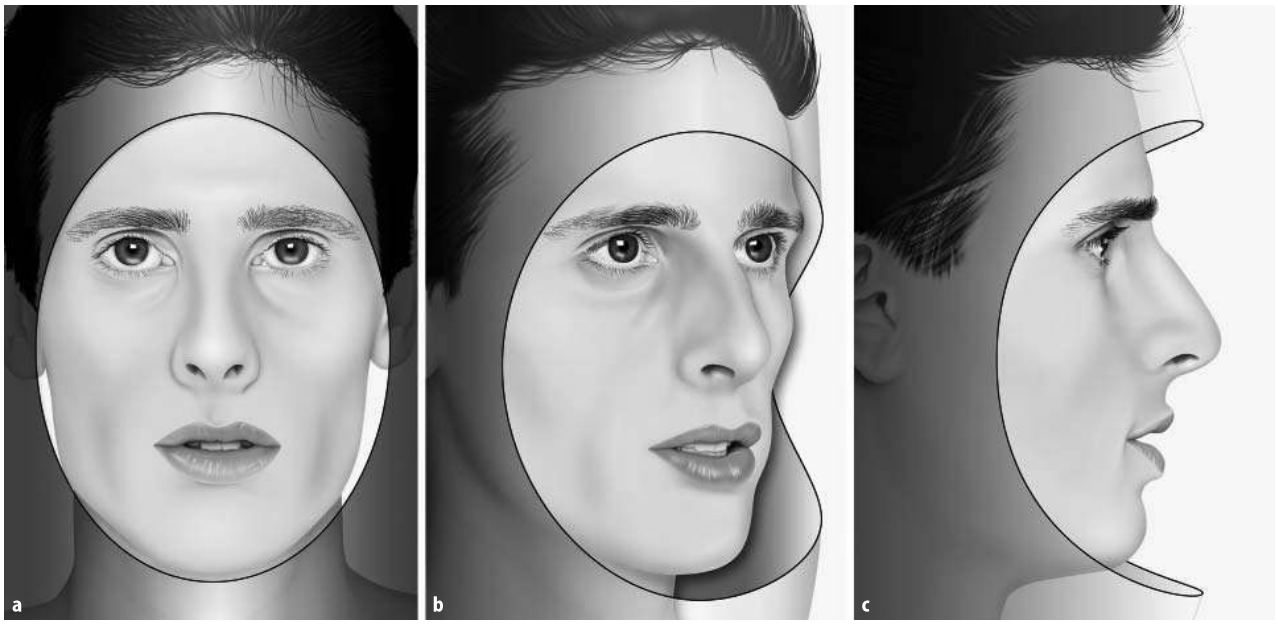


Fig. 5.3. ▼ Frontal (**a**), face-down (**b**) and basal (**c**) views with midline facial points, marked with blue ink, in a clinical case of post-traumatic nasal asymmetry



▲ **Fig. 5.4.** The central oval of the face in frontal (**a**), oblique (**b**), and profile views (**c**)

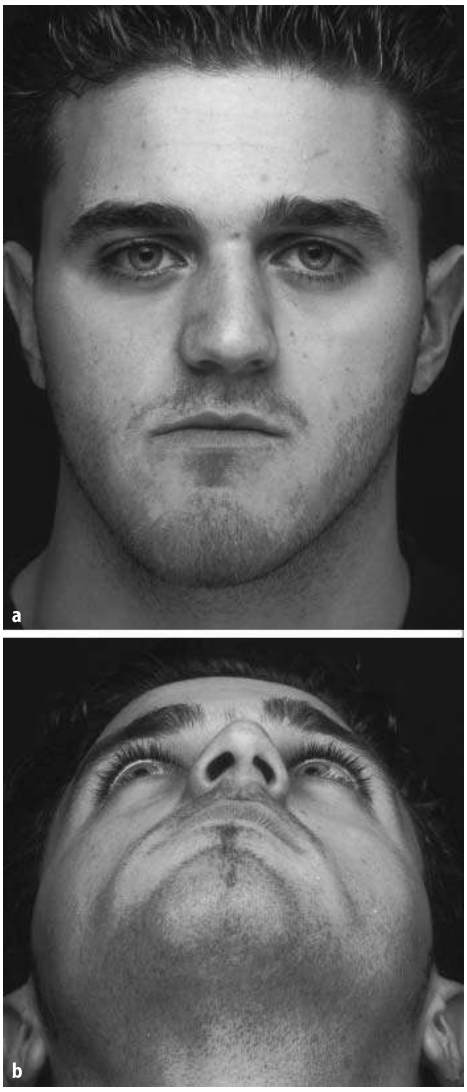


Fig. 5.5. Frontal (**a**) and basal (**b**) views in a clinical case of facial asymmetry

5.2.2 Basal View Analysis

The basal views offer an additional check in the evaluation of general facial symmetry. The shape of the nasal base, the projection of the nasal tip and eye globes, and the shape of the zygomatic arches and chin are all evaluated and judged utilizing the basal view (Fig. 5.5).

5.2.3 Oblique Views Analysis

There are multiple oblique views because, from the pure frontal to the pure profile views, we can find 89 different head positions to the right and 89 different head positions to the left by making small intermediate rotations of one degree. When we try to document a nose with a dorsal deformity, the best oblique view is quite different with the oblique view we need to judge the spatial position of the malar eminence, as depicted in Fig. 5.6.

As recommended in Chap. 3, in every clinical case, I prefer to take at least three different right and left oblique views, changing the camera position and maintaining the position of the subject, with the lighting system fixed.

Ideally, an oblique view should be considered as being composed of two

distinct components, which need to be analyzed separately.

The first one (Fig. 5.7) is the half of the face that is facing the camera (or the eyes of the observer) and is a great aid in the evaluation of the lateral components of the face such as the temporal, zygomatic, orbital, cheek, paranasal, preauricular, and mandibular angle. This component is usually familiar to the patient, as is the frontal view, so it is utilized extensively during communication with her.

The second component (Fig. 5.8) is the profile of the opposite side of the face that emerges on the background panel. In a youthful subject, it is composed of a series of gentle curves, which resembles the outline of an ogee. Here is how J. William Little describes these curves: "the youthful facial ogee typically arises from a high, subtle lid–cheek interface and rises gradually and gracefully to a broad, uniform convexity that peaks near or above the nasal tip. It then continues as a descending convex curve to the level of the upper lip, where it rapidly reverses itself through the occlusal plane, entering a limited concavity that rises slightly at the mandibular border before curving acutely around that structure into the neck" [4].

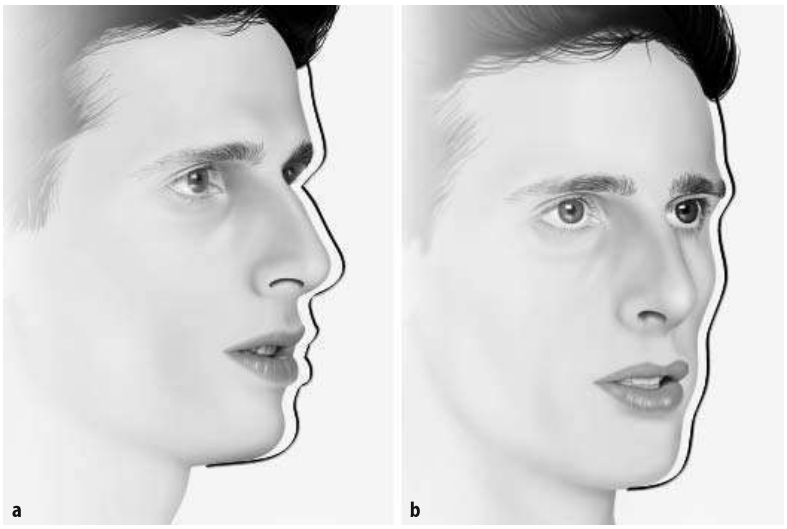


Fig. 5.6. ▲
A more rotated oblique view is preferred to document the nasal pyramid (**a**), whereas a less rotated oblique view is necessary to document the shape of the orbito-zygomatic region (**b**)

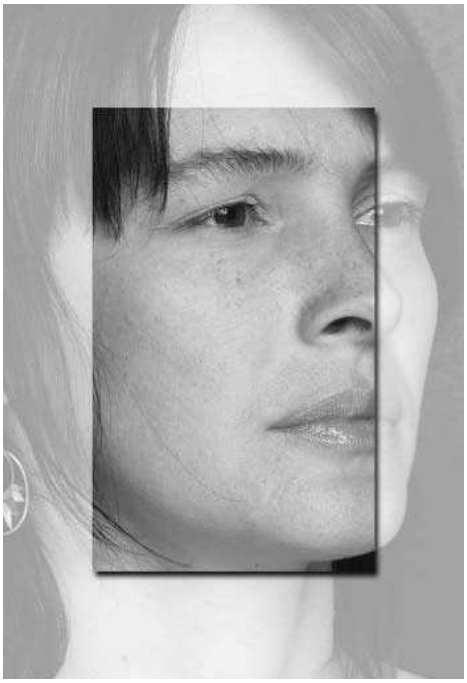


Fig. 5.7.
The first component of the oblique views is facing the camera or the observer's eyes. It is a great aid in the evaluation of the lateral regions of the face such as the temporal, zygomatic, orbital, cheek, preauricular, and mandibular angle

5.2.4 Profile View Analysis

The profile view is both the most utilized by the doctor and the least known by the patient herself. Without a couple of mirrors specifically oriented or a photographic camera, nobody can observe her own profile. How many pictures, captured in profile view, do you have in your personal album? And how many times have you looked at your profile, using two mirrors, in the last year? For that reason, even if the profile view analysis is fundamental for planning and visualizing the treatment goals, it must not be overemphasized to the patient, stating that it is only in the eyes of the beholder.

In all cases, the profile view is essential to judge some basic facial parameters, such as:

- The total face height, the heights of the upper, middle, and lower facial thirds separately, as well the heights of the basic regions of the face (forehead, orbit, nose, upper lip, lower lip, and chin).
- The sagittal (postero-anterior) projection of the orbital ridges, zygoma, nasal radix and tip, lips, and chin.
- The slope of forehead, nasal, infraorbital, columellar, upper and lower lips, submental, mandibular border, and neck outlines.
- The general shape of the facial profile itself in terms of concavity/convexity.

For a better evaluation of the profile view, I suggest adding two reference lines, one

Fig. 5.8. The second component of the oblique views is the opposite profile of the face that emerges on the background panel. In a youthful subject, it is composed of a series of gentle curves, which resembles the outline of an ogee

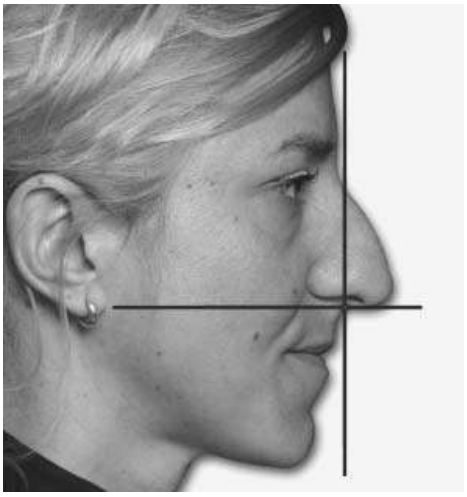
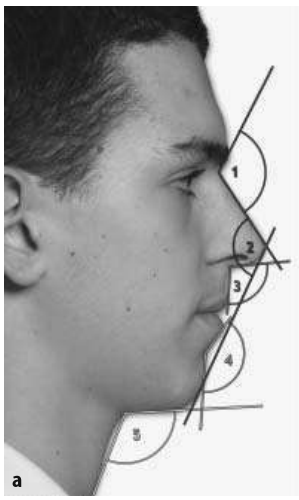
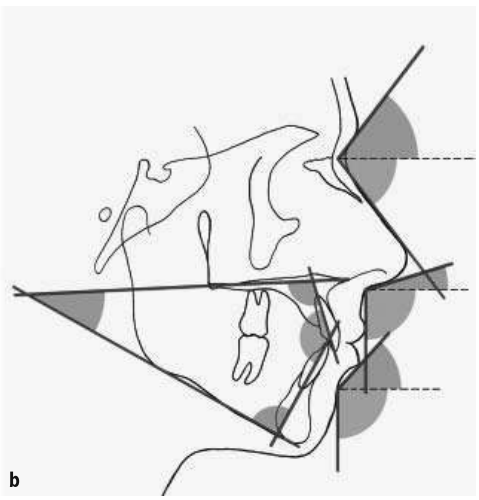


Fig. 5.9. In this photograph, taken in profile view with the subject in the natural head position, horizontal and vertical reference lines, both passing through the subnasale point, aid evaluation of the facial features





▼ **Fig. 5.10.** Angles constructed over a photographic (**a**) and cephalometric tracing (**b**) profile view of the same patient

horizontal and one vertical, both passing through the subnasale point, as depicted in Fig. 5.9.[1] With this approach, the vertical and sagittal position of many points, as well as the incline of some facial outlines can be studied and recorded.

5.3 The Facial Angles

The construction and assessment of facial angles is a fundamental part of basic analysis. Again, the comparison of a clinical case with an average template or normative data is seldom necessary. The most utilized photographic and radiographic view is the profile view, but all of the clinical views proposed in Chap. 3 are suitable for an analysis by angles. In many cases the two straight lines required to construct an angle are drawn connecting some facial points of interest and/or extending a facial outline, as shown in Figs. 5.10 and 5.11.[2]

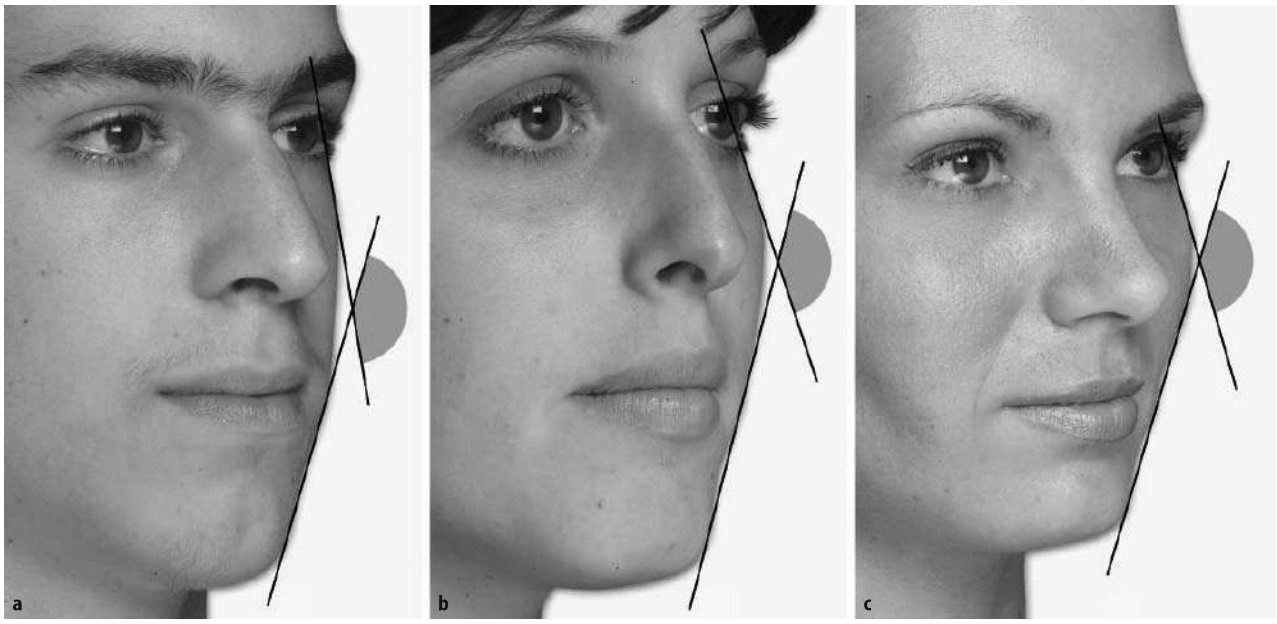
For the angles constructed utilizing views taken in the natural head position, I favor breaking up the angle into its two elementary components by dividing it with a horizontal or vertical line, as depicted in Fig. 5.12. In this manner, each incline can be assessed independently from the others.

5.4 The Supporting Skeleton Assessment

Figure 5.13 illustrates the three main supporting structures of the facial soft tissue envelope: the bony, the cartilaginous, and the dental structures. It can be noted that the major determinant of facial support and shape is a relative-

[1] The complete clinical facial photographic documentation of this clinical case is available in Sect. ❹ of the accompanying CD-Rom (Clinical Case No. 1).

[2] The complete clinical facial photographic documentation of the clinical case of Fig. 5.11b is available in Sect. ❹ of the accompanying CD-Rom (Clinical Case No. 2).



ly small portion of these three components (Fig. 5.13b,c). The eye globe, with its fixed spatial position, may be assumed to be a skeletal supporting structure for the lids.

5.5 Facial Soft Tissue Envelope Assessment

The assessment of skin and soft tissue needs visual and manual inspection. Skin tone, elasticity, ptosis, pigmentation, dynamics, and scars should be shown to and discussed with the patient. Any pigmented lesion or scar must also be documented with multiple photographs (taken at different distances and varying the light incidence), utilizing a ruler, to assess its evolution with time.

To further document and register the characteristics of the facial soft tissue, I suggest the utilization of the fixed, step-by-step method reported in the facial soft tissue analysis checklist, in which each parameter considered must be assessed utilizing a progressive scale.

The first parameter considered is the phototype, utilizing the Fitzpatrick classification, which divides the skin type based on its color and its reaction to the first summer exposure (Table 5.1) [5].

The second parameter considered is the structure of the rhytids with and

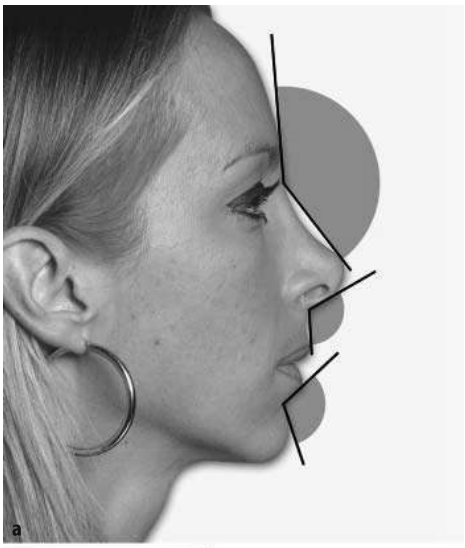


Fig. 5.11. ▲
The same angle constructed over the ogee curve of three different young subjects in which the projection of malar eminence increases from **a** to **c**. There are three parameters to consider: the degree of the angle, the background area between the angle and skin profile and the vertical level of the face at which the angle is positioned. In these three cases, from left to right, the degree of the angle decreases, the background area also decreases, and the vertical position of the angle is higher

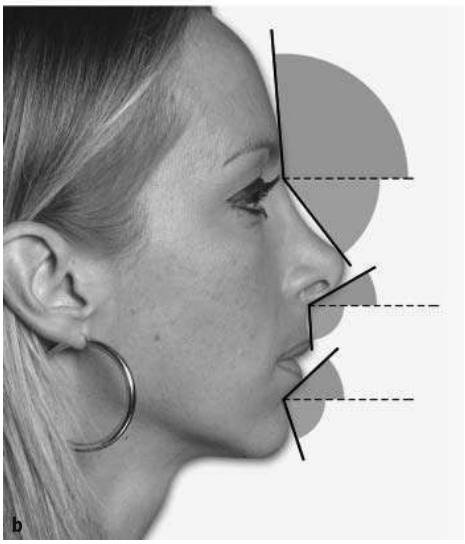
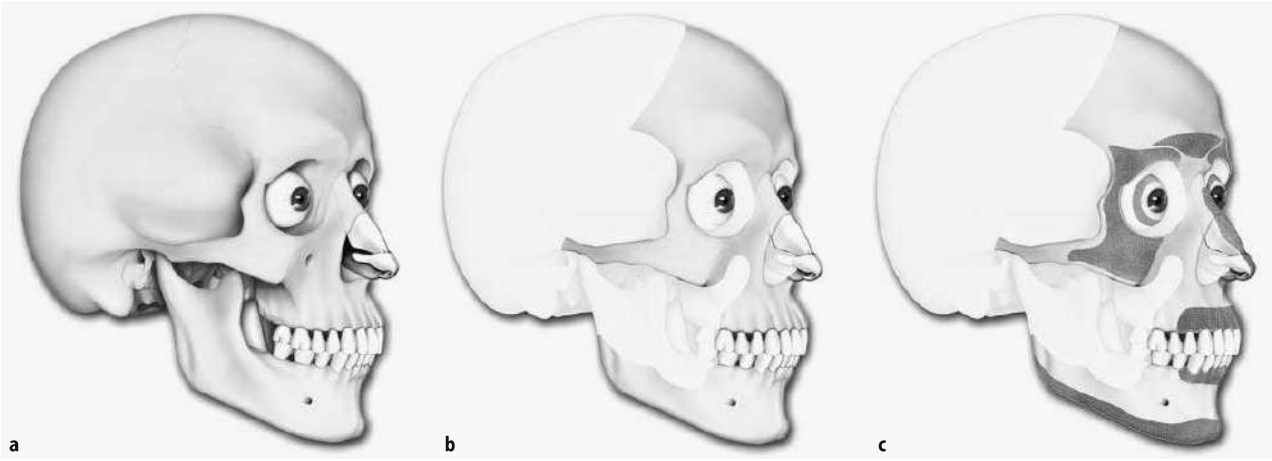


Fig. 5.12.
The absolute value of some facial angles (**a**) can be broken up into their two elementary components by a horizontal or vertical line (**b**). For example, the too wide subnasale angle of this clinical case is due more to an upward rotated columella and less to a clockwise rotated upper lip



▲ **Fig. 5.13.** The portions of the bony skeleton (pale yellow), the teeth (white) and the nasal cartilage (pale blue) as well the eye globe responsible for the "esthetic" support of the facial soft tissue envelope are illustrated (**a**). In **b** and **c** the main structures of support are highlighted

Table 5.1. The Fitzpatrick classification of sun-reactive skin types. From [5]

Skin type	Color	Reaction to sun
I	Very white or freckled	Always burns
II	White	Usually burns
III	White to olive	Sometimes burns
IV	Brown	Rarely burns
V	Dark brown	Very rarely burns
VI	Black	Never burns

without expression, utilizing the Glogau classification (Table 5.2) [1, 2].

The third parameter considered is the general grade of skeletonization/fullness of the face. The scale ranges from grade I, in the case of extreme (pathological) thin facial soft tissue envelope with greatly accentuated bony rims, eye globe, masseter muscle and sternocleidomastoid muscle, to grade V, in which the fat accumulation significantly obscures the underlying skeletal shape. It is important to exclude some regions, like the nasal one, which may have a different grade of skeletonization compared to the rest of the face (Table 5.3).

The fourth parameter considered is the soft tissue laxity grade or the range of passive mobility of the skin over the skeletal and muscular underlying structures and is correlated to the grade of ptosis displayed. The scale ranges from grade I, in the case of an ideal and youthful subject with absence of laxity, to grade V, in which the ptosis is extreme and easy to mobilize with digital traction. Once again, some areas of the face, such as the medial canthus, should not be included in this general evaluation (Table 5.4).

The fifth parameter considered is the active spontaneous mobility grade, due to facial muscular contraction, that is exhibited during a conversation by the patient. The scale ranges from grade I, in the case of very low muscular activity, to grade V, characterized by an excessive mimetic activity. This evaluation is of special importance in the orbital and perioral region due to the functional and aesthetic role played by these muscles (Table 5.5).

Table 5.2. The Glogau wrinkles classification. Adapted from [5] and [1]

Progressive degrees of photo-damage	Typical attributes
Type I: No wrinkles	Typical age 20s to 30s Early photo-aging Mild pigmentary changes No keratoses (skin overgrowths) No or minimal wrinkles
Type II: Wrinkles in motion	Typical age 30s to 40s Early to moderate photo-aging Early senile lentigines Palpable but not visible keratoses Parallel smile lines beginning to appear lateral to mouth
Type III: Wrinkles at rest	Typical age 50 or older Advanced photo-aging Obvious dyscromias, telangectasias Visible keratoses Parallel smile lines beginning to appear lateral to mouth
Type IV: Only wrinkles	Typical age 60 or above Severe photo-aging Yellow–grey skin Prior skin malignancies No normal skin

This systematic assessment of the basic soft tissue envelope can reveal many previously undetected problems that may lead to a less than ideal final aesthetic outcome of our treatment.

Table 5.3. The facial skeletonization/fullness classification

Degrees of skeletonization	Clinical attributes
I Extremely thin	Pathologically skinny subjects
II Thin	Skinny subjects
	Underlying bony and muscular structures easy to recognize
III Slightly thin	Acceptable thin soft tissue envelope
	Slight underweight may be associated
IV Ideal thickness	Ideal soft tissue thickness for age and sex
V Slightly thick	Acceptable thick soft tissue envelope
	Slight overweight may be associated
VI Thick	Overweight subjects
	Underlying bony and muscular structures difficult to recognize
VII Extremely thick	Extremely obese patients (pathological)

Table 5.4. The facial soft tissue degree of laxity scale (the ptosis scale)

Degrees of laxity	Clinical attributes
I Ideal	No sign of laxity
	Typical age up to 20s
II Initial and localized	Difficult to detect by layperson
	Typical age 20s to 30s
	Localized in small facial areas such as upper lids or around lip commissures
III Moderate	Detectable by laypersons
	Typical age 30s to 40s
	Localized mainly in some facial areas
IV Advanced	Diffuse laxity
	Skin easy to re-drape in its original position with digital traction (passive repositioning)
V Extreme	Diffuse facial skin ptosis
	Ptosis sometimes extended to nasal tip
	Functional impairment due to ptosis (e.g., visual field reduction secondary to upper lid ptosis)

Table 5.5. The spontaneous facial musculature activity classification.

Degrees of muscular activity	Clinical attributes
I Limited	Reduced ability in producing specific facial expressions
	Sometimes correlated to obesity or ageing
	May be pathological
II Slightly limited	The range of movement is limited but the ability to communicate emotions is maintained
	Some asymmetric muscular contraction may be possible
III Ideal	The range of movement is appropriate when the subject tries to communicate emotions to others
	Some minor asymmetric muscular contraction may be possible
IV Slightly excessive	The range of movement is enhanced but the ability to communicate emotions is maintained. Some asymmetric muscular contraction may be possible
V Excessive	The excessive facial muscular contraction reduces the ability of the subject to produce a specific facial expression
	May be pathological

5.6 Facial Soft Tissue Analysis Checklist[1]

- Fitzpatrick phototype classification:
  - ❑ I Very white or freckled
  - ❑ II White
  - ❑ III White to olive
  - ❑ IV Brown
  - ❑ V Dark brown
  - ❑ VI Black.
- Glogau wrinkles classification:
  - ❑ I No wrinkles
  - ❑ II Wrinkles in motion
  - ❑ III Wrinkles at rest
  - ❑ IV Only wrinkles.
- Facial skeletonization/fullness classification:
  - ❑ I Extremely thin (pathological)
  - ❑ II Thin
  - ❑ III Slightly thin
  - ❑ IV Ideal thickness for age and sex
  - ❑ V Slightly thick
  - ❑ VI Thick
  - ❑ VII Extremely thick (extremely obese patients).
- Facial soft tissue laxity classification:
  - ❑ I Ideal for sex and age (no evidence of laxity)
  - ❑ II Initial and localized laxity
  - ❑ III Moderate laxity
  - ❑ IV Advanced laxity
  - ❑ V Extreme laxity.
- Facial soft tissue active mobility range:
  - ❑ I Limited
  - ❑ II Slightly limited
  - ❑ III Ideal
  - ❑ IV Slightly excessive
  - ❑ V Excessive.
- Facial soft tissue active mobility symmetry:
  - ❑ Symmetric
  - ❑ Asymmetric (describe the asymmetry.....).

5.7 The Overweight Patient, Facial Analysis, and Surgical Treatment

Some facial areas, such as the cheeks, the preauricular area, the neck, and the sub-

[1] Section ❷ of the enclosed CD-Rom

▲ **Fig. 5.14.** Errors in detecting the inferior scleral show. Oblique close-up view taken in the natural head position and straight gaze with no evidence of scleral show (**a**). The same subject in upward oriented gaze (**b**) and in head tilted down position (**c**) with the appearance of false scleral show

mandibular and submental areas, are more prone to fat accumulation. Others, such as the nasal dorsum and the forehead, are less influenced by fat variations. In some overweight patients, the excess of facial fat can negate the aesthetic results of surgery and, as for some body surgical treatments, decisions about treatment should be deferred until appropriate weight reduction is realized and stabilized.

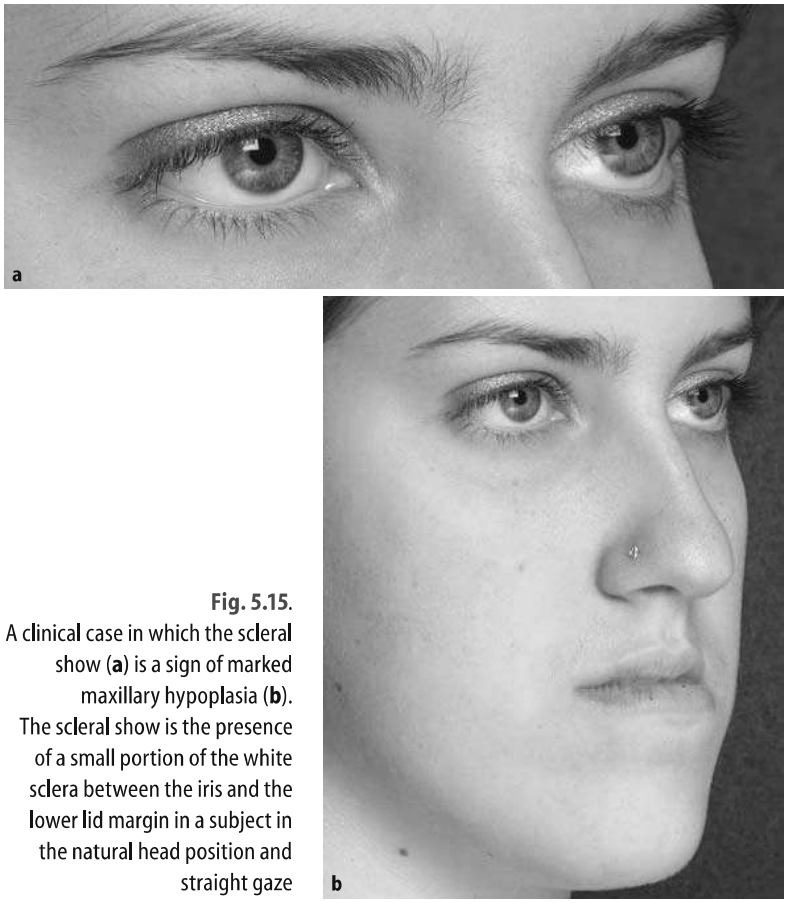


Fig. 5.15. A clinical case in which the scleral show (**a**) is a sign of marked maxillary hypoplasia (**b**). The scleral show is the presence of a small portion of the white sclera between the iris and the lower lid margin in a subject in the natural head position and straight gaze

5.8 From Specific to General: A Reversed Approach to Basic Analysis

This chapter is dedicated to basic facial analysis, which is mainly conducted observing the entire face. But often we need the input offered by a small particular to find out or confirm a general feature of the whole face. In other words, we should combine two key clinical approaches: "from general to specific" and its reverse, "from specific to general."

An example of the latter is given by the presence of the inferior scleral show. This is the presence of a small portion of white sclera between the iris and the lower lid margin in a subject examined in the natural head position and straight gaze. Tilting the head down or orienting the gaze upwards can produce a false scleral show (Fig. 5.14).

A true scleral show can be a sign of regional problems, such as a retracted lower lid or exophthalmia, but also of a whole facial problem such as a hypoplasia of the middle third of the face (Fig. 5.15).

Another specific key point to observe is the sharpness and the incline of the mandibular border outline in profile and oblique views. Its definition is related to the soft tissue thickness and ptosis (Fig. 5.16), whereas the degree of rotation is clearly connected with the vertical feature of the lower third of the face, the chin projection and contour (Fig. 5.17).

5.9 Basic Analysis: Preferred Terms[1]

In this and the subsequent chapters the reader will find one or more sections, presented as an alphabetically ordered glossary, that gives the related terminology used in the text, along with short definitions. The following list explains the essential terminology utilized for basic facial analysis.

- **Bigonial width**. The width of the face, measured between the skin outline at the level of the mandibular angles, in frontal view.
- **Bimental width**. The width of the face, measured between the skin outline at the level of the chin, in frontal view.
- **Bitemporal width**. The width of the face, measured between the skin outline at the level of the temporal region, in frontal view.
- **Bizygomatic width**. The width of the face, measured between the two zygomatic arches at their maximal distance, in frontal view.
- **Central oval of the face**. The extended central region of the face. It is comprised of the eyes, the eyebrows, the zygoma, the nose, the mouth, and the chin [7].
- **Concave/convex profile**. The anterior-posterior relationship of the whole facial profile. It varies from concave, due to a relative posteriorly posi-

[1] Section ❸ of the enclosed CD-Rom

Fig. 5.16.
Facial soft tissue thickness can be appreciated by judging the mandibular border outline and shadowing in oblique and profile views. Two oblique views of young male subjects with moderately thin (**a**) and moderately thick (**b**) soft tissue envelope revealed utilizing the mandibular border outline

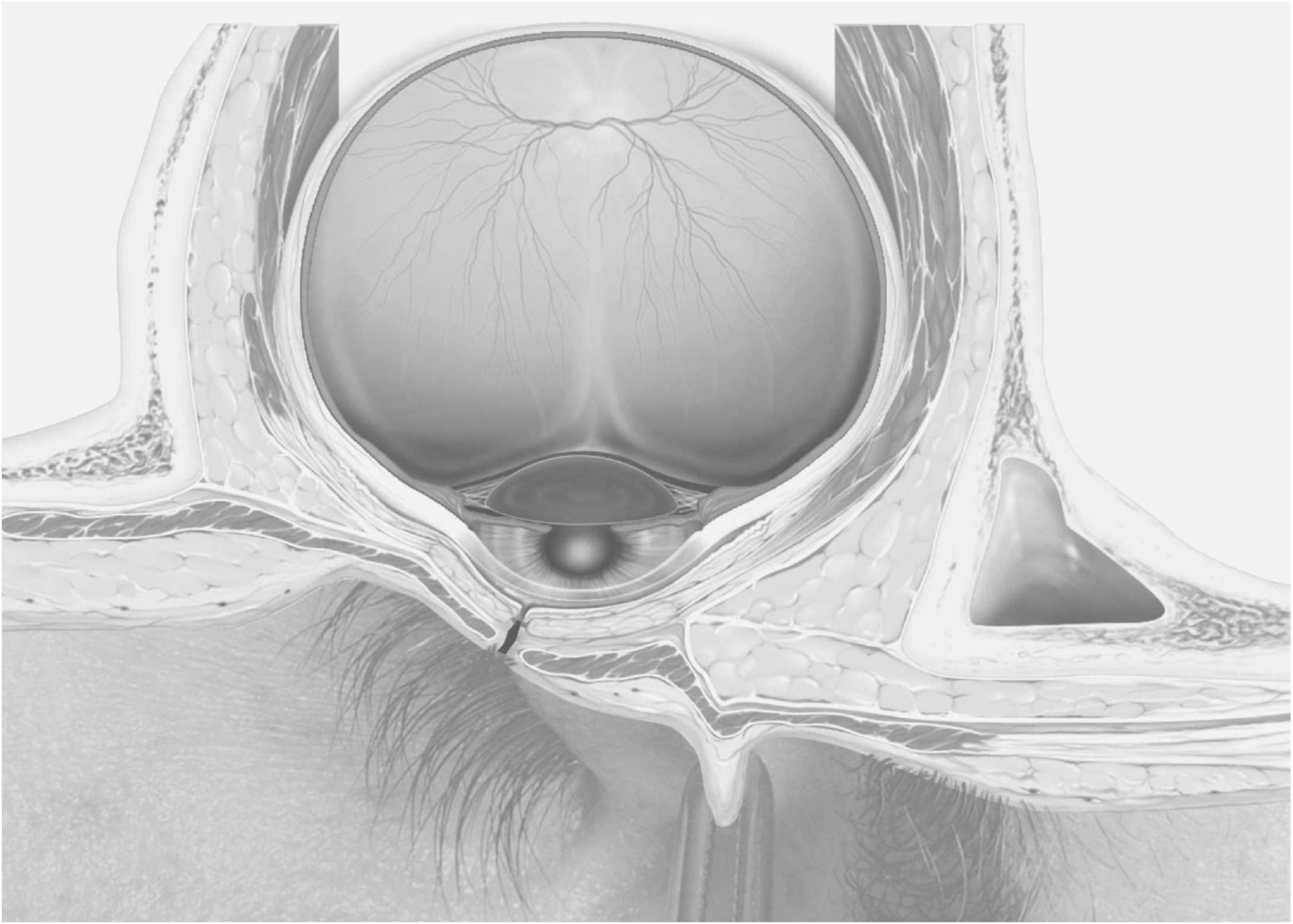
Fig. 5.17. ▼
Different degrees of mandibular border rotation in profile view. Counter-clockwise rotation associated with reduction of the facial lower third height and well-shaped chin outline (**a**). Normal incline of the mandibular border in a subject with thin soft tissue thickness and maintenance of good chin contour (**b**). Clockwise rotation of the mandibular border associated with loss of chin projection, increased facial lower third and poor profile aesthetics (**c**)

tioned middle third, to convex, due to a relative anteriorly positioned middle third. This classification does not define which third of the face is responsible for the deformity.

- **Facial height (total facial height)**. The distance between the trichion and soft tissue menton.
- **Hairline**. The edge of hair round the face.
- **Wide/narrow face**. The predominance and the reduction, respectively, of the four widths of the face over the total facial height.
- **Long/short face**. The predominance and the reduction, respectively, of the total facial height over the four widths of the face.
- **Menton (soft tissue menton)**. Lowest point on the contour of the soft tissue chin. In cephalometric analysis it is found by dropping a perpendicular from the horizontal plane through the skeletal menton [3].
- **Subnasal**. The point at which the columella merges with the upper lip in the midsagittal plane [3]. It varies widely in relation to the caudal septum prominence and nasal spine morphology.
- **Malar eminence**. The point of maximal outer projection of the malar region.
- **Mandibular border outline**. The skin contour line that separates the mandibular body from the submental and submandibular ones.
- **Ogee curve**. The outline of the middle and the lower third of the face viewed in oblique view. This term was introduced by J. William Little and is correlated to the characteristics of the youthful face [4].
- **Triangular/square face**. The classification of the whole face in frontal view based on the relationship between the upper widths (bitemporal and bizygomatic) and the lower ones (bigonial and bimental).
- **Trichion**. The hairline midpoint.

References

1. Bauman L (2002) Photoaging. In: Bauman L (ed) Cosmetic dermatology: principle and practice. McGraw-Hill, New York
2. Glogau RG (1994) Chemical peeling and aging skin. J Geriatr Dermatol 12:31
3. Jacobson A, Vlachos C (1995) Soft tissue evaluation. In: Jacobson A (ed) Radiographic cephalometry: from basics to videoimaging. Quintessence, Chicago
4. Little JW (2000) Volumetric perceptions in midfacial aging with altered priorities for rejuvenation. Plast Reconstr Surg 105:252–266
5. Monheit GD (2002) Combination chemical peelings. In: Lowe NJ (ed) Textbook of facial rejuvenation. The art of minimally invasive combination therapy. Martin Dunitz, London
6. Platzer W (1985) Atlas of topographical anatomy. Georg Thieme Verlag, Stuttgart
7. Ramirez O (2000) The central oval of the face: tridimensional endoscopic rejuvenation. Facial Plast Surg Clin North Am 16:283–298



CHAPTER 6 Forehead, Eyebows, and Eyes

[1] Section ❸ of the enclosed CD-Rom

Looking at the upper third of the face, we can note its role in facial expression. The acts of blinking, raising or lowering the eyebrows, frowning the glabella, elevating the upper lids, closing the eyes, and rotating the eye globes up or down are essential in communicating approval or disapproval, attention, surprise, indifference, and many other emotions. In the long term, the aging process progressively changes the external aspect of the upper third, as well as its dynamics.

For these reasons the analysis of the upper third of the face is not limited to a simple three-dimensional assessment of symmetry, proportion, and shape of the region, but must include the fourth dimension of dynamics and the fifth dimension represented by the effects of the aging process.

6.1 Forehead Analysis

The forehead occupies the upper third of the face entirely and its bony shape and muscle activity are intimately associated with the aesthetics and functions of the orbital and nasal units; its width is about twice its height.

Two skeletal subunits can be considered: the supraorbital bar and the upper forehead [5]. The supraorbital bar, corresponding to the supraorbital rim and glabellar area, greatly influences the aesthetics of the brow, the upper lid and the nasal radix, due to its direct structural support. Its shape varies widely with the development of the frontal sinus, with more angularity and anterior prominence in male subjects than in female ones.

The upper forehead, located above the supraorbital bar, consists of a slight vertical and transversal convexity. The palpable and often visible rim of the temporal fossa, also called the temporal ridge, is the lateral boundary of the forehead.

The hairline, which defines the forehead upper boundary, is quite different between the sexes and, especially in relationship with men's anterior balding, can change with age.

When analyzing the bony forehead, three important aesthetic characteristics should be considered: the general shape, the slope, and the morphology of the supraorbital bar. The outline, in profile and oblique views, varies from round to flat with, sometimes, an inferior concavity defining the supraorbital ridge. The basal view is useful in defining the symmetry, and the grade of transversal convexity.

The soft tissue analysis of the forehead should recognize the glabellar frown lines and the transverse forehead wrinkles or furrows along with the evaluation of the regional muscle dynamics.

Even if the forehead can be reshaped surgically with specific procedures, in the vast majority of cases, it should be considered as a stable and highly visible skeletal structure that can be utilized as a reference in the process of analysis of the shape, volume, and spatial orientation of other structures such as the nose, the mid-face, the anterior teeth, and the chin.

The temporal region, which is bounded inferiorly by the zygomatic arch, anteriorly by the posterior rim of the frontal process of the malar bone and the zygomatic process of the frontal bone, and superiorly by the rim of the temporal fossa, can vary from slightly concave to slightly convex depending on the volume of temporal muscle and subcutaneous fat. The shape and location of the temporal hairline has an important role as a boundary in the aesthetics of the upper third of the face.

6.2 Eyebrow, Eye, and Lids Analysis

From the aesthetic and functional point of view, there is no sense in evaluating the eyebrow separately from the upper lid or any other component of the orbital region. Figure 6.1 shows the surface anatomy of the orbital region along with the related basic terminology.

The assessment of the skeletal support sustained by the orbital ridges and the globe to soft tissue requires the visualization in profile view of three different vertical reference lines, which, in the frontal view, pass through the center of the iris (Fig. 6.2a):

- The corneal line. This is the reference line and requires that the eye globe be in a normal sagittal position.
- The upper orbital rim line. This is 8–10 mm anterior to the corneal plane line depending on the pneumatization of the frontal sinus and the morphology of the supraorbital bar [6].
- The lower orbital rim line. Its position can vary widely from posterior to anterior with respect to the corneal plane line. A protrusive lower orbital rim is associated with good lower lid support and a youthful aspect (Fig. 6.2b), whereas a recessive lower orbital rim line is a sign of infraorbital and midface hypoplasia, which is associated with inadequate support of the lower lid and poor aesthetics (Fig. 6.2c).

The oblique views, examining the upper portion of the ogee curve,[1] are also extremely useful in the evaluation of the skeletal support offered to the lower lid by the inferior and lateral traits of the orbital rim.

6.2.1 The Female Attractive Eye

Many authors have studied the attractive female eye and brow, producing the criteria that were assembled and reformulated by Gunter and Antrobus in their article of 1997 [3]. Some of these are:

- Eyebrow shape.[2] This forms a gentle curve without angularity (Fig. 6.3a). The medial and central portions are wider than the lateral portion (Fig. 6.3b).
- Eyebrow peak. This is located on a vertical plane passing slightly lateral to or touching the lateral limbus (Fig. 6.3c).
- Eyebrow location. The medial end of the eyebrow starts on the same or near the vertical plane of the medial canthus if there is a normal intercanthal

[1] See Sect. 5.2.3, "Oblique Views Analysis."

[2] The size, shape, and spatial position of the eyebrows, in aesthetically pleasing subjects, can vary greatly with age, sex, culture, ethnicity, and fashion trends.

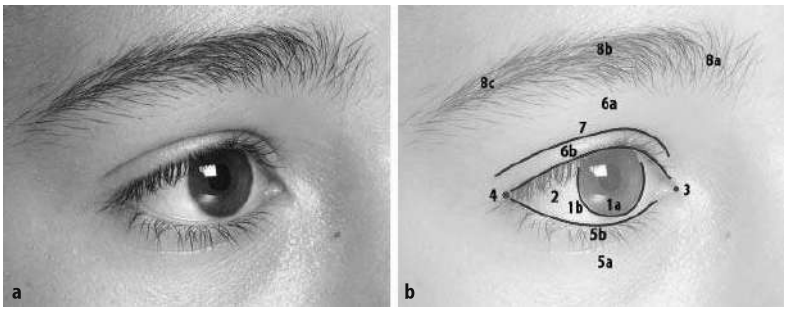


Fig. 6.1. ▲ Close-up oblique view of orbital region in a young subject (**a**). Basic elements of normal surface anatomy of the orbital region (**b**): *1a* iris, *1b* limbus (the circular line separating the iris from the white sclera), *2* white sclera, *3* medial canthus, *4* lateral canthus, *5a* lower lid, *5b* lower lid free margin, *6a* upper lid, *6b* upper lid free margin, *7* upper lid crease, *8a* medial third of the eyebrow (head), *8b* central third of the eyebrow (body), *8c* lateral third of the eyebrow (tail)

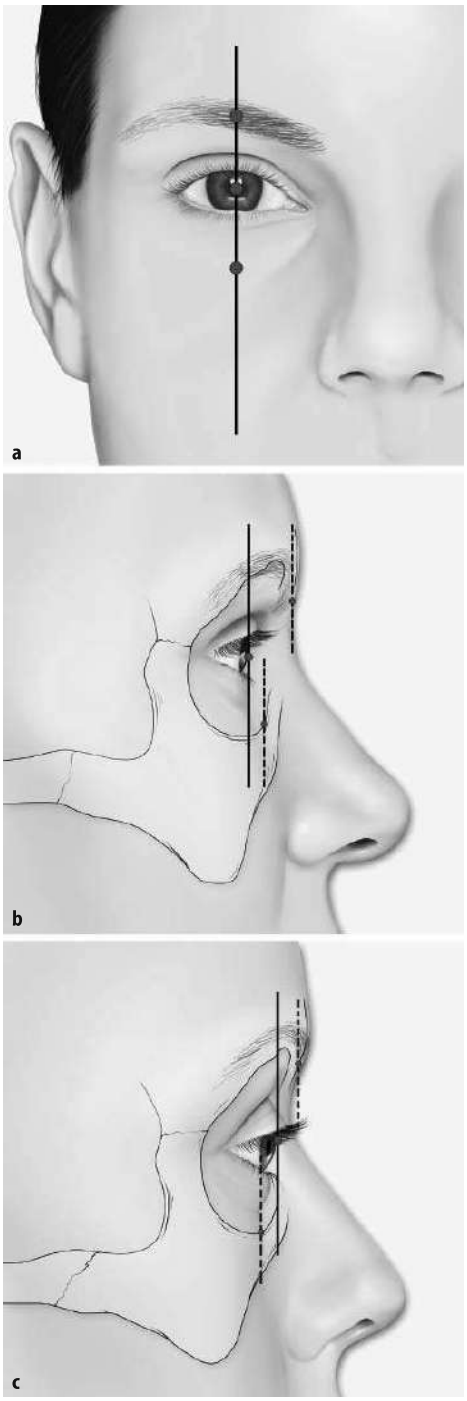


Fig. 6.2. The corneal plane line, the upper orbital rim line and the lower orbital line coincide in the frontal view (**a**). In the case of a normally positioned eye globe, the upper orbital rim line lies anterior to the corneal plane line, whereas the lower orbital rim line can be anterior (**b**) or posterior (**c**) to it

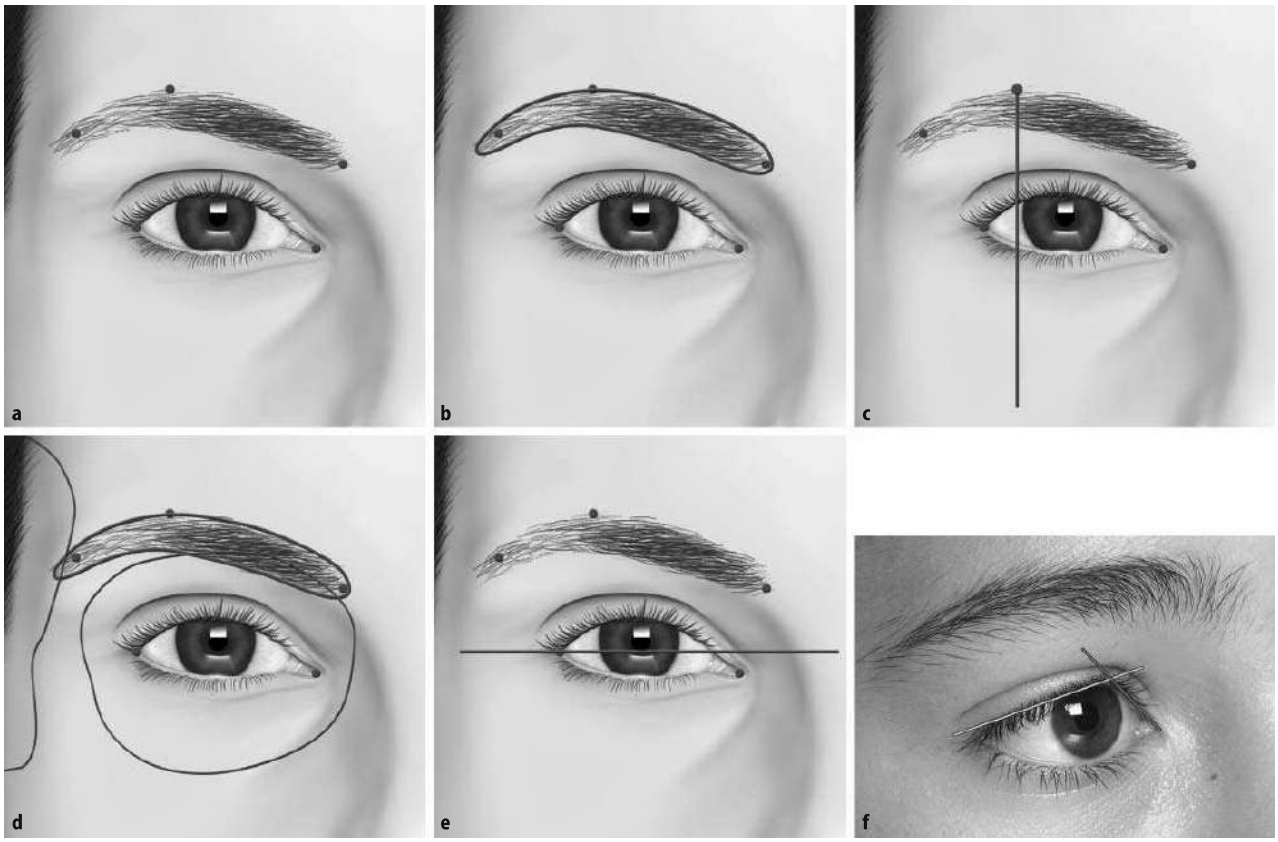


Fig. 6.3. The female attractive eye. The eyebrow shape forms a gentle curve without angularity or interruptions (**a**); the medial and central portions are wider than the lateral (**b**). The eyebrow peak is located on a vertical plane passing lateral to or touching the lateral limbus (**c**). The medial third of the brow lies on the orbital ridge or partially inferior to it, the central third is on the ridge, and the lateral third just above the ridge (**d**). The intercanthal axis should be inclined slightly upward from medial to lateral, producing an upward lateral canthal tilt (**e**). The medial portion of the upper lid margin should be more vertically oriented than the lateral one (**f**)

distance. The medial third lies on the orbital ridge or partially inferior to it, the central third is on the ridge, and the lateral third just above the ridge (Fig. 6.3d).

- Intercanthal axis. It should be inclined slightly upward from medial to lateral, producing an upward lateral canthal tilt (Fig. 6.3e).
- Upper lid/iris relationship. The upper lid should cover the iris by approximately 1–2 mm.
- Medial and lateral portions of the upper lids margin. The medial portion should be more vertically oriented than the lateral one (Fig. 6.3f).
- Upper lid crease. It should parallel the lash line and divide the upper lid into an upper two thirds and a lower one third.
- Medial and lateral extension of the upper lid crease. The medial extension should not exceed the inner extent of the medial canthus and the lateral one should not extend beyond the lateral orbital rim.
- Lower lid/iris relationship. There should be minimal, if any, scleral show between the lower lid and iris.[1]
- Lower lid margin. It should bow gently from medially to laterally, with the lowest point between the pupil and the lateral limbus.

The main differences in the attractive male eye are in the intercanthal axis, which is less inclined upward from medial to lateral, in the supraorbital ridge anterior projection, which is augmented, and in the brow, which is wider, less arched and more horizontally oriented. Figure 6.4 shows a comparison between an attractive female and an attractive male eye.

[1] See Figs. 5.14 and 5.15 for more details about the inferior scleral show.

6.3 Upper Lid Crease Malposition

The vertical position of the upper lid crease must be assessed with precision during clinical examination. It may be related to different conditions such as ethnicity, aging, and levator muscle dehiscence from the tarsal plate [8].

To evaluate the vertical position of the upper lid crease precisely we can utilize the margin crease distance. It is the distance from the central upper eyelid margin to the tarsal crease measured with the eyelid fold elevated by the examiner and as the patient looks down (Fig. 6.5a). The normal range in occidentals reported by Putterman is 9–11 mm [7], whereas that reported by Wolfort, Baker and Kanter is 8–10 mm [9].

Figure 6.5b shows a clinical case of levator dehiscence from the tarsal plate with an increase in the distance of the upper lid crease from the margin.

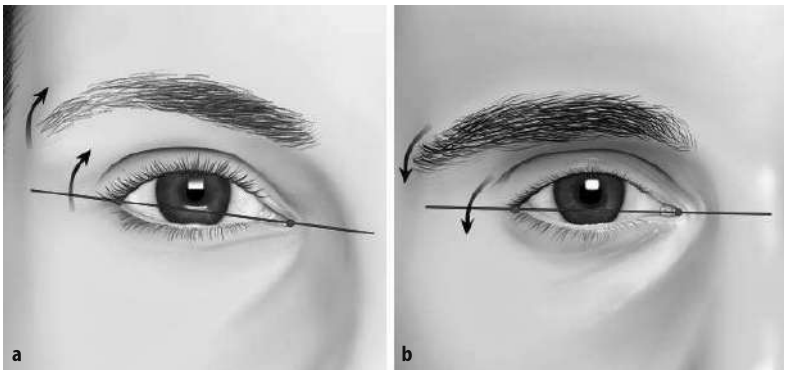


Fig. 6.4. ▲ Comparison between the female attractive (**a**) and the male attractive eye (**b**). In male subjects the intercanthal axis is less inclined upward from medial to lateral, the supraorbital ridge anterior projection is augmented, and the brow is wider, less arched and more horizontally oriented

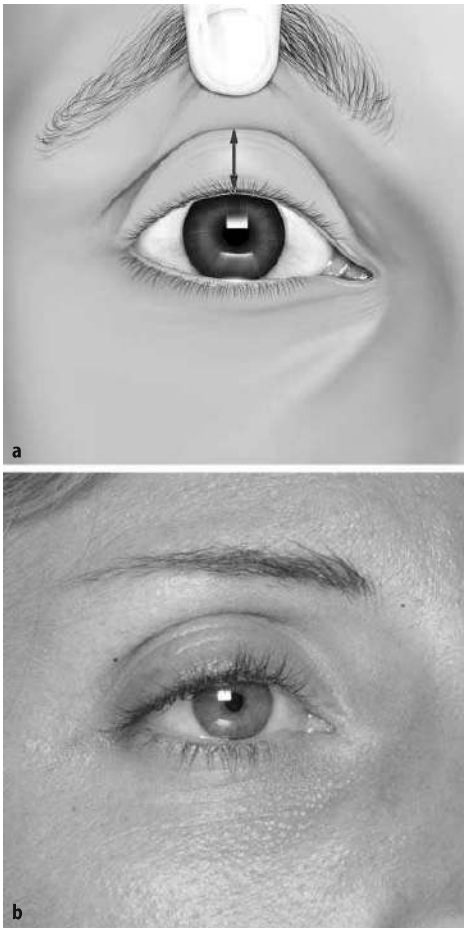
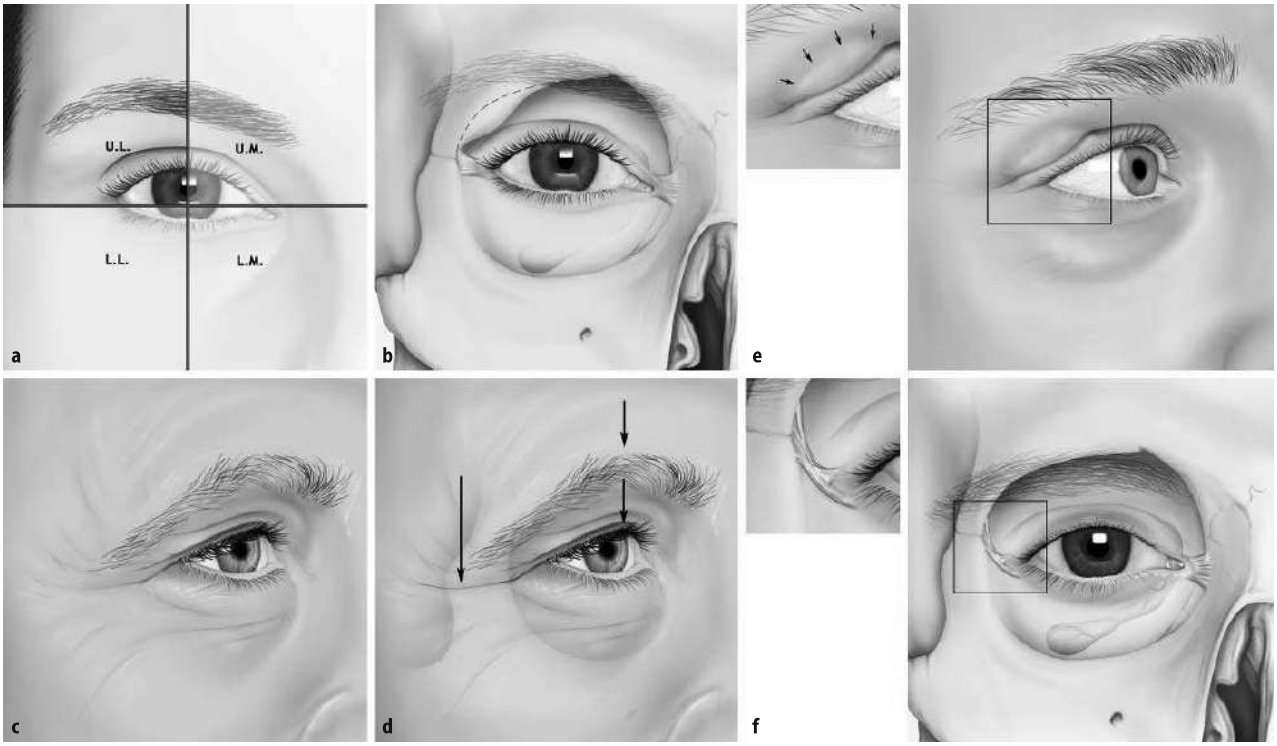


Fig. 6.5. Measurement of the margin crease distance is performed with the eye-fold elevated by the examiner and with the patient looking down (**a**). A clinical case of levator dehiscence from the tarsal plate with an increase in the distance of the upper lid crease from the margin (**b**)

6.4 A Closer Look at the Upper Lateral Orbital Quadrant

The elements of the upper lateral orbital quadrant (Fig. 6.6a) should be inspected, giving special attention to:

- The bony rim. There should be no inferior protruding of the upper lateral orbital ridge, which is responsible for a sad and aged appearance in young subjects (Fig. 6.6b).
- The lateral portion of the brow. Its rest position should not appear to the observer as a sign of sadness, tiredness or astonishment, as discussed in the following paragraph (Fig. 6.6c).
- The lateral portion of the upper lid crease. It is important to detect a lateral extension over the eyelid and onto the lateral periorbital region of the upper lid crease (Connell's sign), which is a hallmark of forehead ptosis [6] (Fig. 6.6d).
- The presence of a prolapsed lacrimal gland. It can produce an excessive fullness of the lateral third of the upper eyelid (there is no fat in the upper temporal angle of the orbit) (Fig. 6.6e). On the other hand, a moderate fullness of the lateral third of the upper eyelid is aesthetically favorable in women [4].
- The lateral commissure. The laxity of the lateral canthal tendon (lateral canthal bowing) produces an inferior rotation of the commissure (Fig. 6.6f).



▲ **Fig. 6.6.** The upper lateral orbital quadrant (**a**). Hanging upper lateral orbital ridge (**b**). Malposition of the lateral brow at rest, resulting in a sad appearance (**c**). Lateral extension of the upper lid crease over the eyelid and onto the lateral periorbital region, or Connell's sign (**d**). Prolapsed lacrimal gland, producing an excessive fullness of the lateral third of the upper eyelid (**e**). Laxity of the lateral canthal tendon, producing an inferiorly rotated commissure (**f**)

6.5 Eyebrow Malposition and Inappropriate Expressions

Eyebrow malposition can produce an unattractive or unwanted look with a negative impact in relationships with others [3, 6]. The surprised/unintelligent look is produced by over-elevation of the eyebrows. Also the medial placement of the brow peak creates an undesired surprised look. The angry look is due to a low medial brow with a high lateral peak, whereas a large asymmetry in the height of the eyebrows gives the inquisitive appearance.

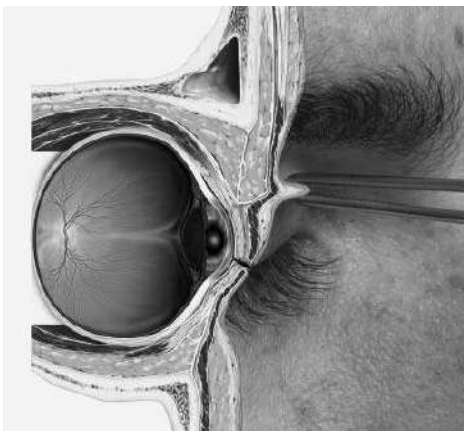


Fig. 6.7. Upper lid early dermatochalasis assessed with the pinch technique. The examiner pinches the excess of eyelid skin with a forceps until the eyelashes begin to evert

Sometimes the patient is obliged to contract the frontalis muscle to clear the upper visual field obstruction produced by forehead and upper lid ptosis. The result is a bilateral excessive elevation of the medial brows and a corrugated forehead, producing a sad–tired appearance. The surgical removal of upper lid skin excess clears the upper visual field and induces the relaxation of the frontalis with an evident medial brow ptosis and a new, unwanted, angry appearance [6].

During the clinical examination and shooting the photographs it is fundamental to document these "pseudoexpressions" imposed by the periorbital soft tissue anatomy and dynamics. Some of the eye views, such as the unforced closed view and the looking down view,[1] help to highlight the frontalis muscle contraction, giving a clearer idea of the real vertical position of the eyebrow at rest.

[1] See Figs. 3.18 and 3.19.

6.6 Suspect and Search for the Early Signs of Aging in the Upper Third of the Face

When analyzing a middle-aged subject from the aesthetic point of view, a difficult and at the same time important task is to break up the global problem into its basic elements. These elements are the deformities, which should be considered mainly as a constant factor, any pathology and post-traumatic sequelae, which may or may not be present, and the aging process, which risks being underestimated in that age group.

Sometimes a deformity of the orbital margins, such as infraorbital hypoplasia, lateral orbital rim overhang, and excessive pneumatization of the frontal sinus, can be mistaken as a sign of premature aging. In other cases, the opposite may happen and a well-supporting skeleton can positively influence the soft tissue envelope, hiding the aging changes for years.

I always expect and search for the signs of aging in the forehead and orbital region, as it can be detected much earlier than in other facial regions, giving me and my patient the opportunity to deal with these problems with a long-term plan.

Essentially I look for the following three signs: dermatochalasis, loss of lid tone (eyelid laxity), and herniated orbital fat.

- Dermatochalasis is the excess of eyelid skin. It is usually more relevant in the upper eyelids and is also a frequent condition in middle-aged subjects. The skin excess can be assessed by pinching the excess of eyelid skin with forceps until the eyelashes begin to evert (Fig. 6.7).
- The loss of lid tone is usually more relevant in the lower lid. We refer to lid tone as the ability of the lids to maintain spontaneously and recover (recapture) quickly their normal position against the globe. The presence of horizontal lower lid laxity should be assessed performing the distraction test and the snap test [2]. The lid should not be pulled more than 7 mm away from the inferior limbus (distraction test – Fig. 6.8a) and, after the distraction, should snap back into its normal position immediately (snap test – Fig. 6.8b).
- The herniated orbital fat. By gently pressing on the globe, it is possible to produce the protrusion of fat pockets (Fig. 6.9a). The lower lid fat is also assessed with the subject in the upright sitting or standing position and gaze-up eye globes orientation (Fig. 6.9b).

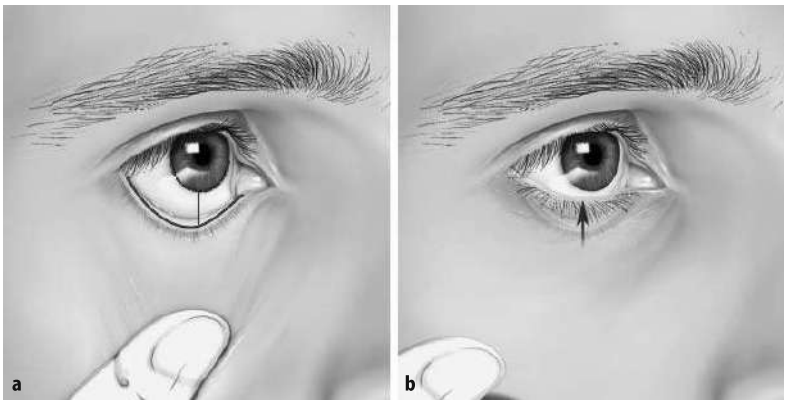


Fig. 6.8. ▲ Lower lid horizontal laxity assessment. Distraction test: the lower lid margin should not be pulled more than 7 mm away from the inferior limbus (**a**). Snap test: after distraction, the lower lid should snap back into its normal position immediately (**b**)

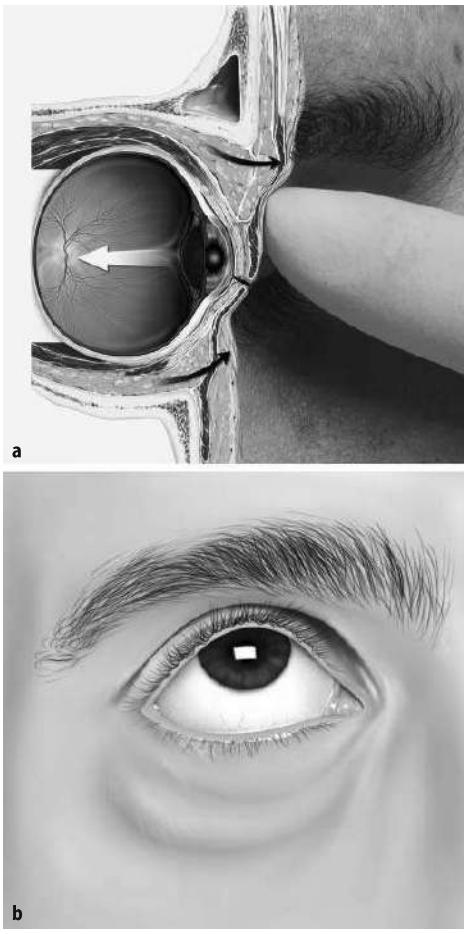


Fig. 6.9. The herniated orbital fat can be highlighted by applying gentle pressure to the eye globe (**a**). Lower lid herniated orbital fat is better assessed with the subject in an upright position and gaze-up eye globe orientation (**b**). In the supine position the orbital fat, due to its mobility, spontaneously repositions into the orbit and is less evident

In the supine position the orbital fat, due to its mobility, is spontaneously repositioned into the orbit and is not usually evident in young adults.

Chapter 9 considers further the relationship between skeletal deformities and the aging appearance, whereas Chap. 10 discusses the aging of the upper third of the face in adults and elderly subjects.

6.7 Forehead, Eyebrows, and Eyes Analysis Checklist[1]

- Is the upper third of the face symmetric?
  - ❑ Yes
  - ❑ No, because ...
- Are the two orbital regions symmetric?
  - ❑ Yes
  - ❑ No, because ...
- In the frontal view, the forehead is:
  - ❑ Wide
  - ❑ Narrow
  - ❑ Long
  - ❑ Short
- The trichion is:
  - ❑ Normally positioned
  - ❑ Too high
  - ❑ Too low
- The forehead profile is:
  - ❑ Flat
  - ❑ Round
  - ❑ Presence of inferior concavity (clear definite orbital bar)
- The supraorbital bar is:
  - ❑ Normally shaped
  - ❑ Protruding
  - ❑ Recessive
- Skeletal lower lid support:
  - ❑ Poor
  - ❑ Acceptable
  - ❑ Ideal
- Define the malar eminence:
  - ❑ Hypoplastic
  - ❑ Balanced
  - ❑ Pronounced
- Define the symmetry of the eyebrows:
  - ❑ Present
  - ❑ Absent due to ...
- Define the symmetry of the eye globes:
  - ❑ Present
  - ❑ Absent due to ...
- Define the symmetry of the eyelids:
  - ❑ Present
  - ❑ Absent due to ...
- Define the eyebrow position:
  - ❑ Ideal for sex and age
  - ❑ Altered, because ...
- Define the upper lid crease position:
  - ❑ Ideal
  - ❑ Too high
  - ❑ Too low
- Define the upper lid margin position:
  - ❑ Ideal
  - ❑ Too high
  - ❑ Too low
- Define the lower lid margin position:
  - ❑ Ideal
  - ❑ Too low
- Define the medial canthus position:
  - ❑ Ideal
  - ❑ Altered, because ...
- Define the lateral canthus position:
  - ❑ Ideal
  - ❑ Altered, because ...
- Eyelid dermatochalasis:
  - ❑ Absent
  - ❑ Moderate
  - ❑ Marked
  - ❑ Limiting the supero-temporal visual field (pathological)
- Upper eyelid ptosis:
  - ❑ Right ...
  - ❑ Left ...
- Lower eyelid laxity:
  - ❑ Right ...
  - ❑ Left ...
- Scleral show:
  - ❑ Right (... mm)
  - ❑ Left (... mm)
- Upper lid herniated orbital fat:
  - ❑ Right
  - ❑ Left
- Lower lid herniated orbital fat:
  - ❑ Right
  - ❑ Left
- Prolapsed lacrimal gland:
  - ❑ Right
  - ❑ Left

[1] Section ❷ of the enclosed CD-Rom

- Festoons (cheek bags):
  - ❑ Right ...
  - ❑ Left ...
- Eyeglobe proptosis (exophthalmos):
  - ❑ Right ...
  - ❑ Left ...
- Eyeglobe enophthalmos:
  - ❑ Right ...
  - ❑ Left ...
- Hypertrophic orbicularis oculi muscle (tarsal portion):
  - ❑ Right ...
  - ❑ Left ...

6.8 Forehead, Eyebrows, and Eyes: Preferred Terms[1]

- **Blepharochalasis.** Should be differentiated from dermatochalasis. It is an uncommon condition characterized by episodic edema and erythema of the eyelids. Blepharochalasis is more common in young women and may result in premature relaxation and laxity of the eyelid skin with wrinkling and hooding [2].
- **Blepharoptosis.** Ptosis of the upper lid over the eyeball. The grade of blepharoptosis is evaluated measuring the palpebral aperture in the primary, upward, and downward position of gaze.
- **Connell's sign.** Lateral extension over the eyelid and onto the lateral periorbital region of the upper lid crease. Connell's sign is considered to be a hallmark of forehead ptosis [6].
- **Crow's feet and eyelid wrinkles.** Fine wrinkles or lines developing on the lower lid and the lateral aspect of the orbital region perpendicular to the fibers of the underlying orbicularis oculi muscle (see Chap. 10, "Mimetic lines").
- **Dermatochalasis.** Excess of eyelid (redundant) skin, which is usually more prevalent in the upper eyelids. It is a frequent condition in middle-aged subjects and a common one in the elderly.
- **Ectropion.** Eversion of the eyelid margin away from the globe. It is more common in the lower eyelid.
- **Enophthalmos.** The abnormal recession of the eyeball into the orbit.
- **Entropion.** The inward rotation of the eyelid in such a way that the eyelid margin, eyelashes, and skin of the eyelid rub against the globe, resulting in irritative symptoms and possibly abrasion and scarring of the cornea.
- **Epiphora.** The overflow of tears as a result of impeded outflow or excessive secretion.
- **Exophthalmos.** The abnormal prominence or protrusion of the eyeball.
- **Eyebrow ptosis** – The inferior migration of the eyebrow below its natural position over or above the superior orbital rim.
- **Eyelid bags (baggy eyelid).** The visible bags of the lower eyelid caused by the processes of pseudoherniation of orbital fat and attenuation and lengthening of the orbital septum, orbicularis oculi muscle, skin, and lower canthus (see also festoons).
- **Eyelid laxity.** See lid tone.
- **Eyelid rims (upper and lower).** The free margins of the eyelids.
- **Festoons (or cheek bags, malar bags).** Ptosis of the sub-orbicularis oculi fat. Malar bags can be differentiated from eyelid bags because they occur below the inferior orbital rim.
- **Forehead transverse furrows.** The long horizontal mimetic furrows developing on the forehead perpendicular to the fibers of the underlying frontalis muscle.
- **Glabellar creases (frown lines, vertical glabellar lines).** The mainly vertically oriented mimetic skin lines developing on the glabella perpendicular to the fibers of the underlying corrugator muscle (see Chap. 10, "Mimetic lines").
- **Herniated orbital fat (pseudoherniated orbital fat).** The anterior displacement of the fat located under the orbital septum. It should be examined with the patient in the upright sitting or standing position. The orbital fat pads are classically divided into two upper compartments (medial and central) and three lower compart-

[1] Section ❸ of the enclosed CD-Rom

ments (medial, central, and lateral). This is usually due to the attenuation of the orbital septum.

- **Horizontal palpebral aperture**. The distance between the lateral and medial canthus. The average length is 30–40 mm [1].
- **Hypertrophic orbicularis oculi muscle**. A horizontal band or ridge of the pretarsal portion of the lower lid orbicularis oculi muscle that is accentuated by smiling.
- **Inferior scleral show**. See scleral show.
- **Intercanthal axis**. The imaginary line connecting the medial and lateral canthus.
- **Lacrimal gland**. A small gland that normally occupies the lacrimal fossa of the frontal bone inside the upper temporal angle of the orbit (see also prolapsed lacrimal gland).
- **Lagophthalmos**. Incomplete eyelid closure.
- **Lateral canthus**. The lateral angle formed by the junction of the two free margins of the eyelids.
- **Lid tone**. The ability of the lids to maintain spontaneously and recover (recapture) quickly their normal position against the globe when pulled away. The presence of horizontal lid laxity can be assessed performing the snap test and the lid distraction test. The lid should not be pulled more than 7 mm away from the globe (distraction test) and should snap back into its normal position immediately (snap test).
- **Limbus (iris limbus)**. The circular margin of the iris with white sclera.
- **Lower palpebral fissure width**. The distance from the central point of the cornea to the central lower eyelid margin with the patient's eye in straight gaze. It is normally about 5.5 mm and increases with lower lid retraction [7].
- **Malar hypoplasia**. The condition of skeletal flatness of the malar region that is normally prominent.
- **Margin crease distance**. The distance from the central upper eyelid margin to the tarsal crease measured with the eyelid fold elevated by the examiner and as the patient looks down. The normal range reported by Putterman is 9–11 mm [7], whereas that for Wolfort, Baker and Kanter is 8–10 mm [9]. An elevated upper lid crease may be a sign of disinsertion of the levator aponeurosis.
- **Medial canthus**. The medial angle formed by the junction of the two free margins of the eyelids.
- **Palpebral fissure width (vertical palpebral aperture)**. The distance from the central lower eyelid to the central upper eyelid margins with the patient's eye in straight gaze. Normally it is about 10 mm [7]. A smaller measurement usually indicates ptosis of the upper lid, whereas a bigger measurement could be a sign of eyelid retraction. It can be divided into the upper and the lower palpebral fissure width.
- **Prolapsed lacrimal gland**. A prolapsed lacrimal gland can produce an excessive fullness of the upper eyelid in the temporal third (there is no orbital fat in the upper temporal angle of the orbit).
- **Scleral show (inferior scleral show)**. The presence of a strip of white sclera between the iris and the lower lid margin with the subject in the natural head position and straight gaze. It may be a sign of exophthalmos, previous trauma, prior surgery, lower lid laxity or dentofacial deformities with maxillary hypoplasia.
- **Tarsal crease of the upper lid (upper lid crease)**. The horizontal sulcus of the upper lid that normally divides it into an inferior tarsal portion and a superior septal portion. It is frequently hidden in adult and aged subjects by skin redundancy.
- **Trichion**. The hairline midline point.
- **Trichiasis**. The condition in which the eyelashes are in contact with the eye globe.
- **Upper palpebral fissure width**. The distance from the central point of the cornea to the central upper eyelid margin with the patient's eye in straight gaze. The normal range is 4–4.5 mm [7]. A lower value usually indicates ptosis of the upper lid, whereas a larger one could be a sign of upper lid retraction. If a ptotic eyelid covers

the central point of the cornea, the number of millimeters that the eyelid must be raised is recorded as a negative number.

- **Vertical palpebral aperture**. See palpebral fissure width.

References

1. Bosniak SL (1990) Cosmetic blepharoplasty. Raven Press, New York
2. Gross SC, Kanter WR (1995) Preoperative assessment for eyelid surgery. In: Wolfort FG, Kanter WR. Aesthetic blepharoplasty. Little, Brown and Company, Boston, pp 53–77
3. Gunter JP, Antrobus SD (1997) Aesthetic analysis of the eyebrows. Plast Reconstr Surg 99:1808–1816
4. Hoefflin SM (2002) The beautiful face: the first mathematical definition, classification and creation of true facial beauty. Santa Monica (ISBN 0–9713445–0-7)
5. Marchac D (1991) Aesthetic contouring of the forehead utilizing bone grafts and osteotomies. In: Ousterhout DK. Aesthetic contouring of the craniofacial skeleton. Little, Brown and Company, Boston, p 222
6. Marten TJ, Knize DM (2001) Forehead aesthetics and preoperative assessment of the foreheadplasty patient. In: Knize DM (ed) The forehead and temporal fossa. Anatomy and technique. Lippincott Williams & Wilkins, Philadelphia, pp 91–99
7. Putterman AM (1999) Evaluation of the cosmetic oculoplastic surgery patient. In: Putterman AM (ed) Cosmetic oculoplastic surgery. Eyelid, forehead, and facial techniques. W.B. Saunders Company, Philadelphia
8. Spinelli HM (2004) Atlas of aesthetic eyelid and periocular surgery. W.B. Saunders Company, Philadelphia
9. Wolfort FG, Baker T, Kanter WR (1995) Aesthetic goals in blepharoplasty. In: Wolfort FG, Kanter WR. Aesthetic blepharoplasty. Little, Brown and Company, Boston

CHAPTER 7 Nasal Analysis

[1] Section ❷ of the enclosed CD-Rom
[2] Section ❸ of the enclosed CD-Rom

The nose, with its central position, plays a major role in facial aesthetics and the parameters that one must consider in clinical nasal analysis are impressive. For that reason, its evaluation is best done utilizing a practical and comprehensive checklist and writing down, for each clinical case, a list of the features discovered.

As a protruding structure, the nose must be studied trying to envision its composite supporting framework, which is the main determinant of the external shape.

7.1 Points, Lines, and Subunits of the External Nose

As for the whole face, the surface of the nasal pyramid offers some points, lines, and areas for consideration (Fig. 7.1):

1. Alar base width
2. Alar crease junction
3. Alar groove
4. Alar rim
5. Columella
6. Columellar base
7. Columella outline
8. Footplates of the medial crura
9. Glabella
10. Nasal base line
11. Nasal dorsum outline
12. Nasal lobule
13. Nasal lobule outline
14. Nasal radix outline
15. Nasal "unbroken" line
16. Nasion
17. Nostril sill
18. Rhinion (clinically this is evaluated with direct palpation of the dorsum)
19. Soft triangle or facet
20. Subnasale
21. Supratip area or supratip break point in clinical cases where a clear step over the nasal tip is present
22. Nasal tip
23. Tip defining points

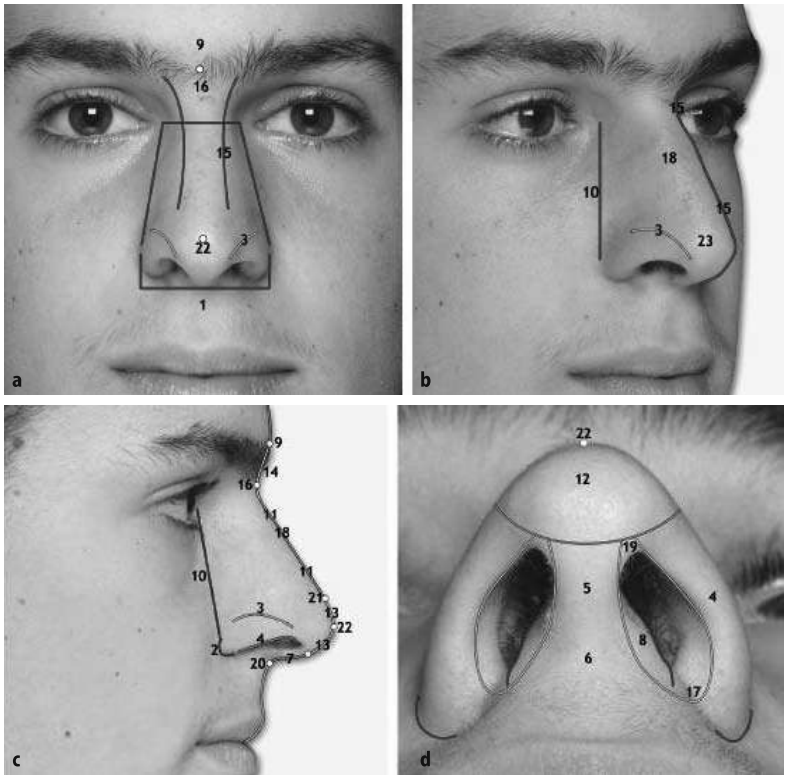


Fig. 7.1. Points, lines, and subunits of the nasal surface in frontal (**a**), oblique (**b**), profile (**c**), and basal view (**d**). The numbers refer to the list in Sect. 7.1

7.2 Direct and Photographic Clinical Analysis for Nasal Deformities

A note reporting the major findings regarding nasal aesthetics, determined by visual inspection and palpation only, is made during the first consultation. The successive revision and enhancement of the definitive form is written when the photographic documentation, either in a printed form or on a wide monitor, is also available.

Defining a nose as short or long, narrow or wide should also be related to the sex, height, physique, and primarily to the whole face of the subject. A "balanced" nose exists only for a given face! This assumption points out the necessity of a general facial analysis prior to any specific evaluation of the nasal subunits.

7.2.1 General Considerations

The first step is the assessment of the general symmetry of the face and nose utilizing one reliable horizontal reference line. The most commonly utilized horizontal references are the lines connecting the medial canthus, the upper palpebral folds, or the apex of the eyebrow, which are easy to detect and draw; the next step is the creation of a unique vertical midline that should bisect the glabella, the nasal bridge, the nasal tip,

Fig. 7.2.
An example of a symmetric face with an asymmetric nose secondary to a previous trauma (**a–d**); in this case, the horizontal reference lines are reliable in constructing the vertical midline. In a complex asymmetric case, instead of a unique central vertical line, it is necessary to trace several small midline segments for every facial subunit (**e–h**) in order to evaluate better the role of the nose in the whole asymmetry

and the Cupid's bow (Fig 7.2a–d). In a complex case, instead of a unique vertical midline, it is necessary to trace several small midline segments for every facial subunit to evaluate better the role of nasal asymmetry in the context of an asymmetric face (Fig 7.2e–h).

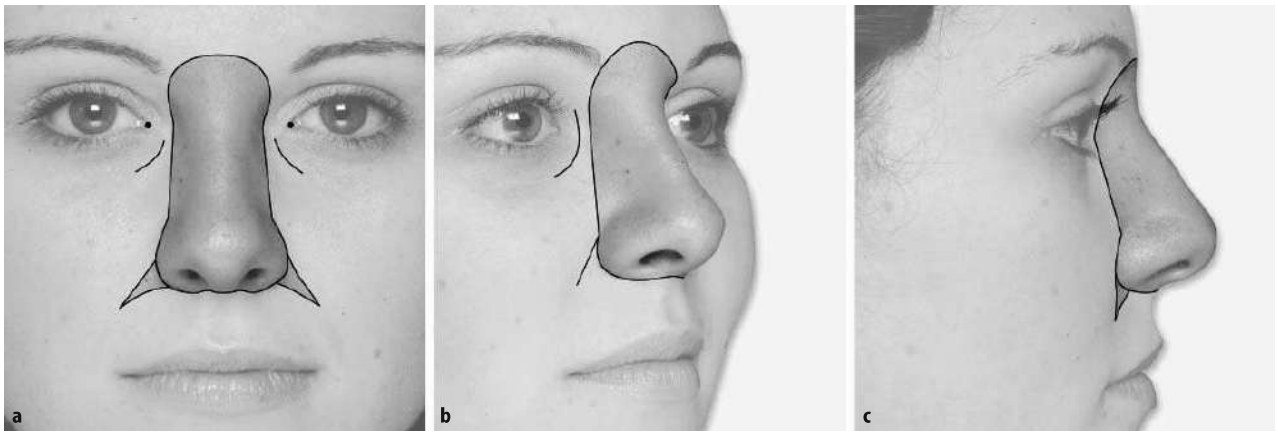
The skeletal boundaries of the nose must be evaluated in order to recognize the surrounding structures from which the nasal pyramid emerges. Figure 7.3 shows these boundaries in a subject with an adequate supporting base, whereas Fig. 7.4 depicts three cases of depressed paranasal region due to maxillary hypoplasia and a case of a too protruding anterior nasal spine that greatly influences how the observer sees the shape and the projection of the nose. The reader can find the clinical and instrumental assessment of skeletal midface deformities in Chap. 9.

Utilizing the oblique views, the entire nasal outline must be evaluated, searching for the presence of a bilateral symmetric "unbroken" line [11]. In the attractive nose, this line descends gracefully from the supraorbital ridge onto the nasal dorsum and the nasal tip (Fig. 7.5).

In the case of a deviated nose, dorsal irregularities, a dorsal hump or a dorsal saddle, this line is "broken," creating one or two steps or a strong curve as depicted in Fig. 7.6. Utilizing the nasal outline obtained from the oblique view helps in the assessment of the type, grade, and location of the deformity.

The nasal profile slope should be assessed clinically and utilizing the full-face profile view for a better comparison with the whole facial profile. In many cases, identifying and drawing the dorsal line is an easy task and the difficulties that can remain lie only in the construction of a correct facial plane (Fig. 7.7).

In some nasal and dentofacial deformities, the assessment of nasal slope can be difficult. In a post-traumatic nose



▲ **Fig. 7.3.** The skeletal boundaries of the nasal pyramid in frontal (**a**), oblique (**b**), and profile view (**c**)

with dorsal irregularities, as in a combination of bone hump and cartilage saddle, more than one dorsal line can be considered (Fig. 7.8). Furthermore, none of these lines can be utilized as guidance for the visualization of the treatment goals as they reflect the actual situation measured at different levels (bony nasal dorsum, cartilaginous nasal dorsum, and nasal lobule outline) and not the ideal slope for this subject[1].

The difficulty in assessing the nasal slope increases in the case of obvious nasal deformity combined with an equally obvious dentofacial deformity. Tracing some reference points and lines helps the observer to distinguish and grade the severity of each deformity (Fig. 7.9). In the sections dedicated to specific nasal regions, such as radix and lobule, more of the factors affecting the real and perceived nasal slope are explored.

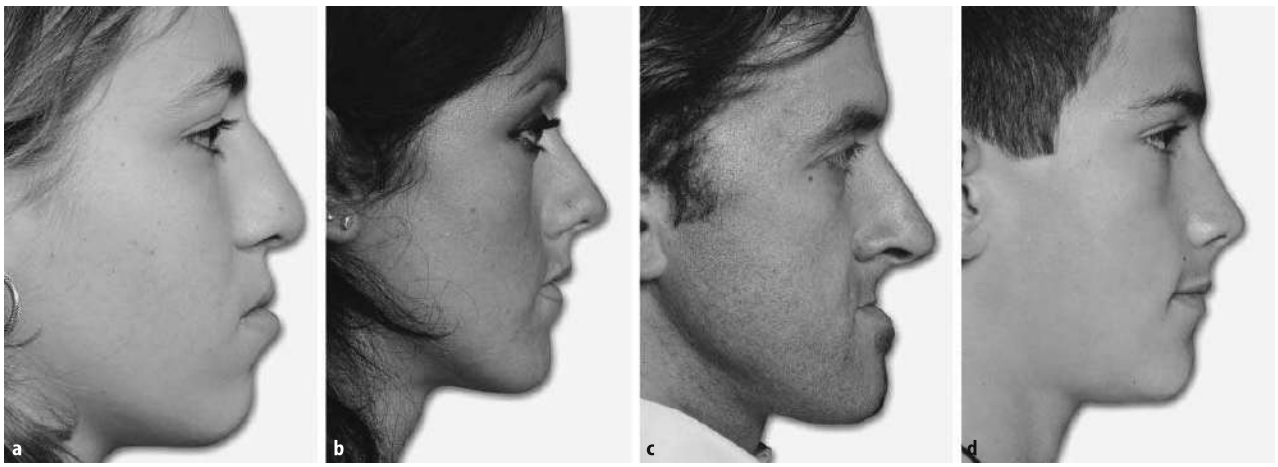
The next step consists of the appreciation of nasal widths. It should be done considering eight different basic parameters:

- Whole nasal width
- Radix width at the level of the base
- Radix width at the level of the profile
- Dorsal width at the level of the base
- Dorsal width at the level of the profile
- Alar base width
- Nasal tip width
- Columellar base width

Figure 7.10 shows a case of a large nose in which all eight widths are depicted.

The general nose assessment is not finished without examining the overlaying skin and without the information obtainable by palpation. The skin assessment is a very important step; from radix to tip, along the midline, the thickness of the soft tissue envelope is thick over the

[1] The complete clinical facial photographic documentation of this case is available in Sect. ❹ of the accompanying CD-Rom (Clinical Case No. 3).



▼ **Fig. 7.4.** Three cases of depressed paranasal region due to maxillary hypoplasia (**a–c**) and a case of a too protruding anterior nasal spine (**d**) that greatly influences how the observer sees the shape and projection of the nose

glabella and radix breakpoint, thinner over the rhinion and thick again at the supratip area (Fig. 7.11a). Moving from the midline to the nasal base line, at the level of the radix and osteocartilaginous dorsum, the skin thickness increases (Fig. 7.11b). The skin thickness at the level of the lobule and the base of columella is highly variable and must be assessed precisely in each case (Fig. 7.11c–f).

Utilizing the thumb and the index finger of the dominant hand (Fig. 7.12), the nose is palpated in order to establish:

- The length of the nasal bones (Fig. 7.12a).
- The presence of any bony or cartilaginous irregularities (Fig. 7.12b–c).
- The level of the most anterior–inferior aspect of the septal cartilage profile with respect to the most projecting point of the lobule (Fig. 7.12d).
- The resistance offered by the cartilaginous dorsum and nasal tip to posterior displacement by pressure as well the speed with which the tip returns to its normal configuration upon release (Fig. 7.12e, f).
- The grade of passive mobility of the skin over the skeletal framework.

Other points to consider regarding the nasal soft tissue envelope are the presence of scars, the grade of elasticity and atrophy, as well the presence of telangectasias.

7.2.2 Nasal Upper Third Assessment

Identifying the spatial location of the radix break-point and the definition of the nasofrontal angle is a fundamental part of nasal analysis.

The radix break-point is the most posterior point of the outline between the nasal dorsum and the frontal bone. Any change in the radix break-point influences how the observer judges the length as well as the slope of the entire nose. It is best assessed utilizing the corneal plane, the glabella, and the superior palpebral fold[1] as references (Fig. 7.13).

[1] Each of these references is also critically checked for its reliability.

Fig. 7.5.
The nasal unbroken line is the outline of the nasal pyramid in oblique view. In the attractive nose, this line descends gracefully and symmetrically from the supraorbital ridge onto the nasal dorsum and the nasal tip

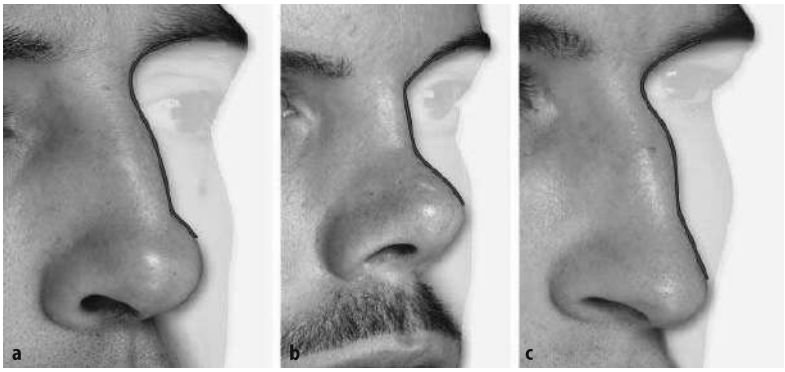


Fig. 7.6. ▲
The nasal outline in oblique view of a dorsal hump (**a**), a dorsal saddle (**b**), and a crooked nose (**c**)

The nasofrontal angle is not necessarily measured and can be assessed simply by drawing (or imaging) two lines on the profile. The upper line is based on the mean inclination of the outline from glabella to the radix break-point, whereas the lower one is based on the mean inclination of the outline from the

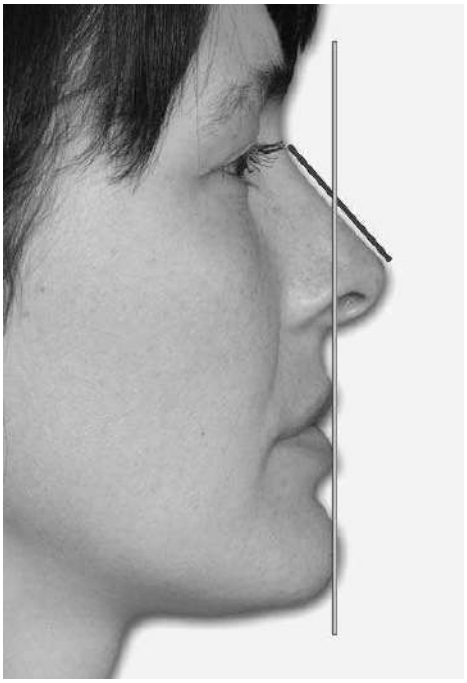
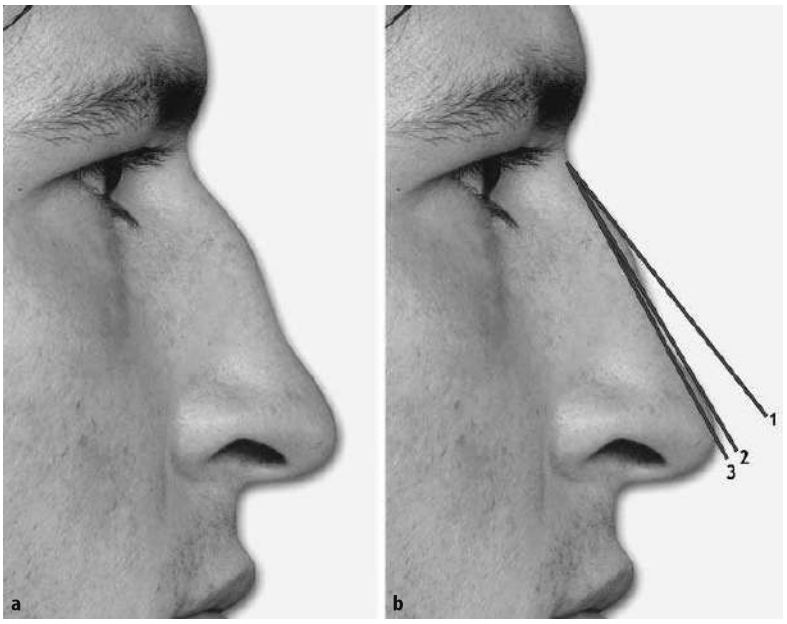


Fig. 7.7.
Identifying and tracing the dorsal line can be relatively easy to do in the case of a straight dorsal outline. In this patient the main difficulty is recognizing the projection of the chin that alters the facial plane. A vertical reference line passing through the subnasale point helps in the visualization of the excess chin projection



▲ Fig. 7.8.
A case in which the outcome of nasal trauma results in a bone hump and a cartilaginous saddle (**a**). The construction of the dorsal profile line can be done in different ways (**b**): line 1 is superimposed on nasal bone outline, line 2 is superimposed on lobule outline, and line 3 is superimposed on cartilaginous dorsum outline. None of these lines can be utilized as guidance for the visualization of the treatment goals as they reflect the actual situation measured at different levels (bony nasal dorsum, cartilaginous nasal dorsum, and nasal lobule outline) and not the ideal slope for this subject

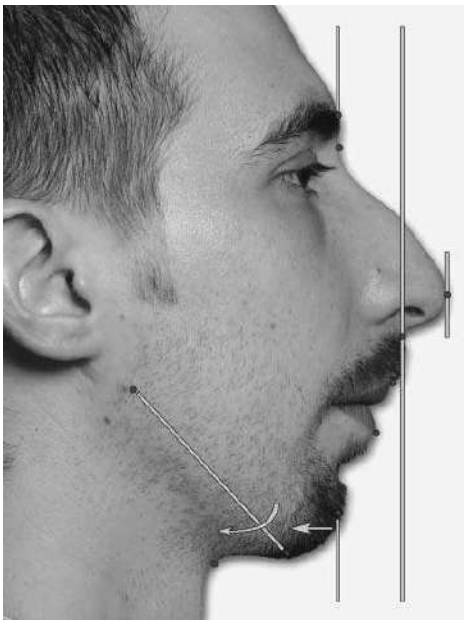


Fig. 7.9. ▲
A clinical case combining a clear nasal and dentofacial deformity. Tracing of some reference points and lines helps to distinguish and grade the severity of each deformity. On understanding the degree of the microgenia and mandibular clockwise rotation, the extent of the counterclockwise rotation of the nasal slope is not as great as may appear on initial examination

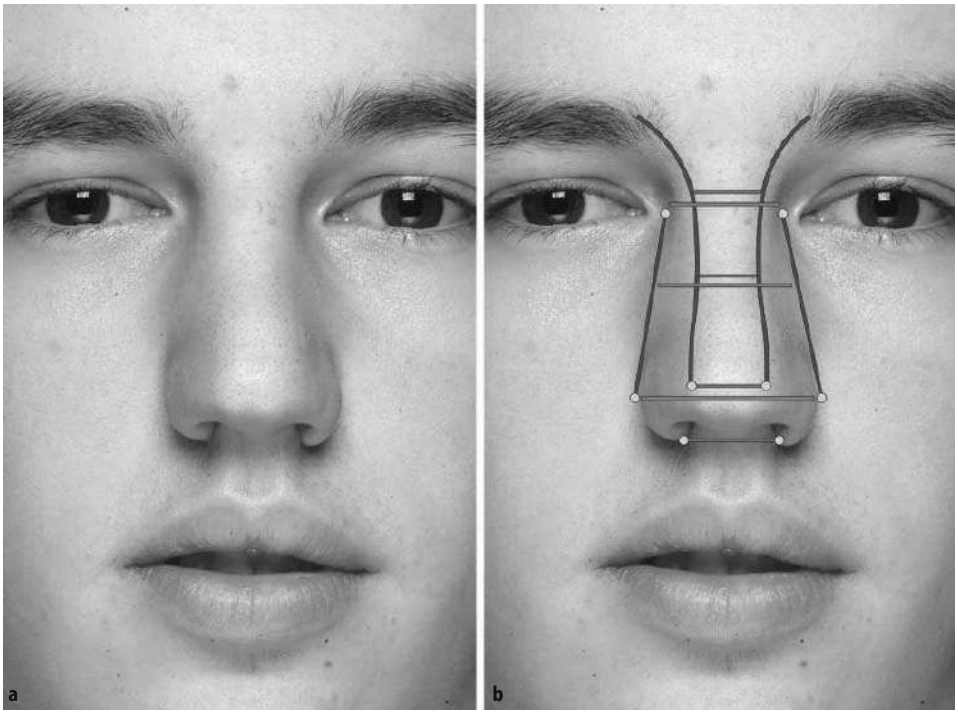


Fig. 7.10.
Frontal view of a "large nose" in a teenager (**a**). The analysis of nasal width should consider eight different basic parameters (**b**): whole nasal width, radix width at the level of the base, radix width at the level of the profile, dorsal width at the level of the base, dorsal width at the level of the profile, alar base width, nasal tip width, columellar base width

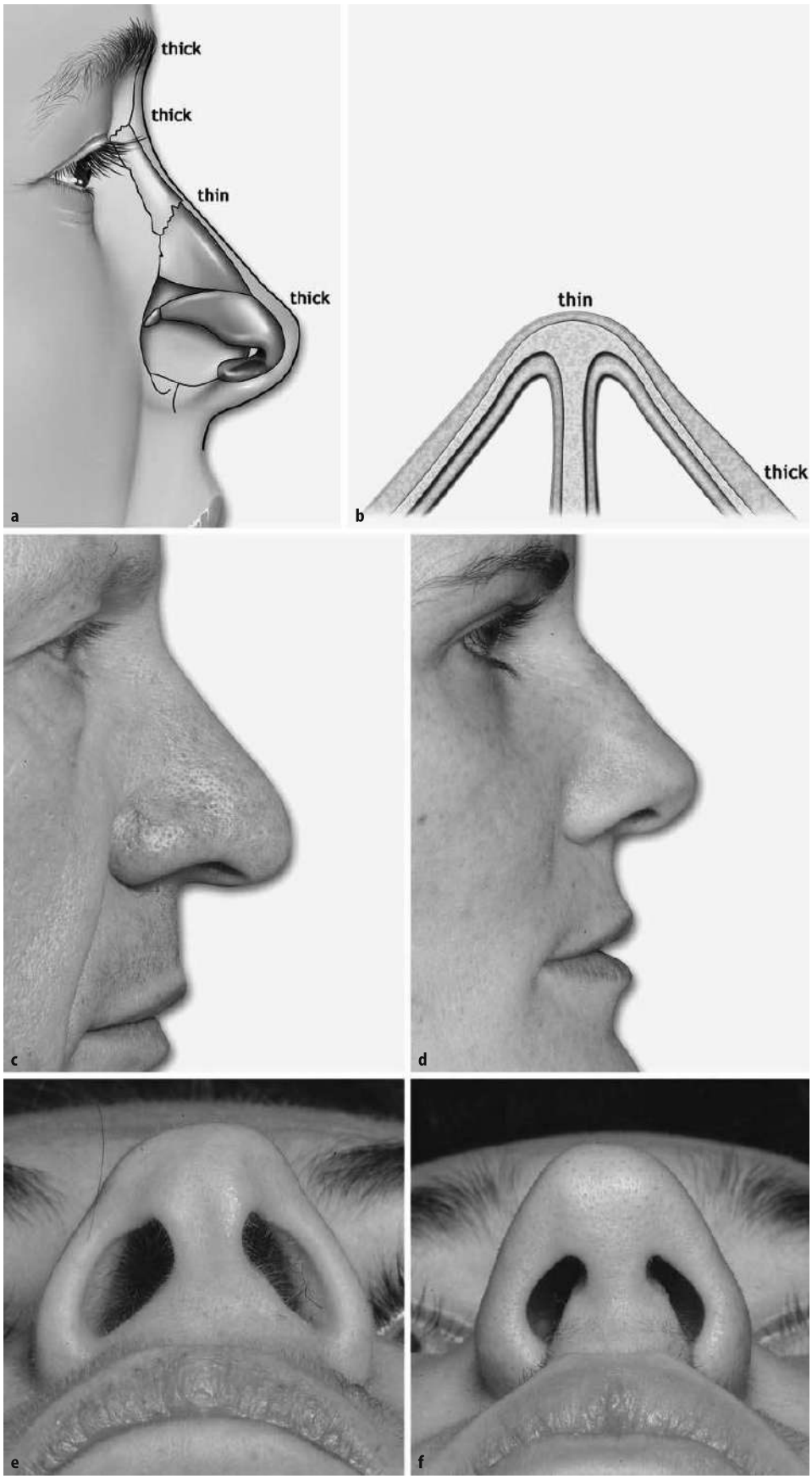


Fig. 7.11.
From radix to tip, along the midline, the thickness of the soft tissue envelope is thick over the glabella and radix breakpoint, thinner over the rhinion and thick again at the supratip area (**a**). Moving from the midline to the nasal base line, at the level of the radix and osteocartilaginous dorsum, the skin thickness progressively increases (**b**). A case of thick sebaceous skin that hides the underlying cartilaginous skeleton of the nasal tip (**c**) and the opposite condition in which the shape and volume of the lower lateral cartilage are easily assessed through the skin (**d–e**). A clinical case presenting a large columellar base due to increased soft tissue envelope thickness (**f**)

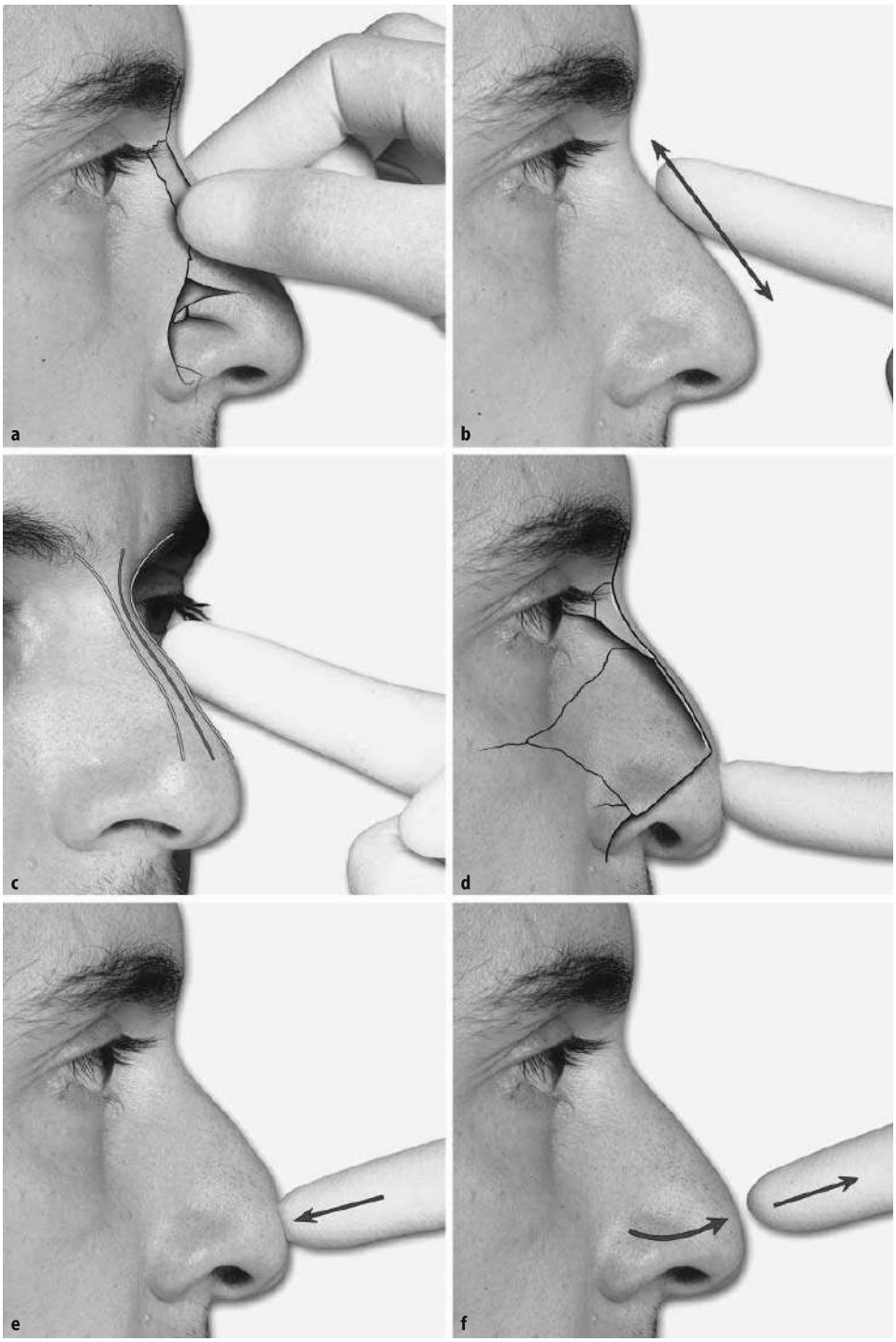


Fig. 7.12. Utilizing the thumb and the index finger of the dominant hand, the examiner can feel the distal end of the paired nasal bones (**a**), detect any bony or cartilaginous irregularities on the midline or the lateral aspects of the dorsum otherwise not evident (**b, c**), evaluate the distal portion of the septal cartilage outline normally hidden between the two domes (**d**), feel the amount of resistance offered by the cartilaginous dorsum and nasal tip to posterior displacement, also observing the speed of the tip to return to its normal configuration upon release (**e, f**)

radix break-point to the supratip area. Figure 7.14 shows the nasofrontal angle of the three clinical cases presented in Fig. 7.13.

The profile of the bony portion is usually one third of the entire nasal dorsum and should be palpated to identify the real length of the nasal bones. Any convexity/concavity, symmetry/asymmetry, unilateral/bilateral lateral hump must be assessed visually.

7.2.3 Nasal Middle Third Assessment

The clinical analysis of the central portion of the nasal pyramid considers the symmetry, outline, slope, volume, and

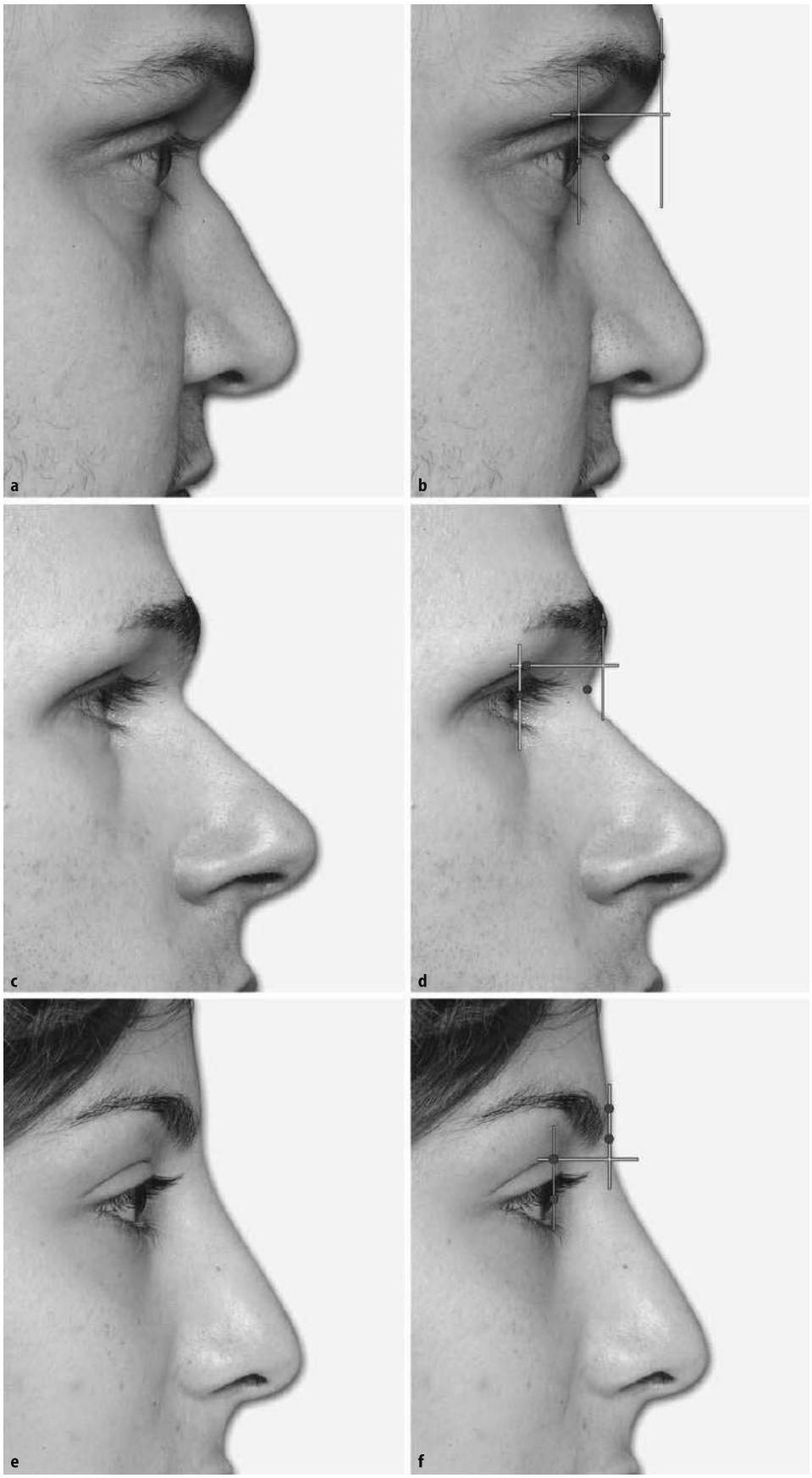
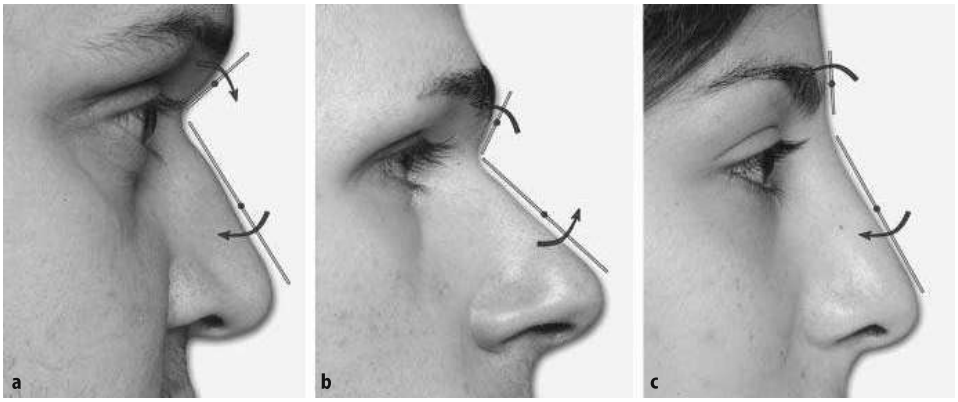


Fig. 7.13.
Profile views of three different clinical examples of nasal radix. A too posterior and inferior nasal radix near the corneal plane and well below the superior palpebral fold; the anteriorly positioned glabella is in part secondary to the pneumatization of the frontal sinus (**a, b**). An inferior positioned radix break-point, clearly below the superior palpebral fold, which can be mistakenly judged as being too posterior; in this case the distance between the corneal plane and the nasal outline is not reduced (**c, d**). A shallow nasal upper third outline with a too anterior and superior radix break-point, which makes the nose appear too long (**e, f**)

shape of the cartilaginous dorsum. A particular mental exercise, that of correlating the external aspect of the nasal dorsum at every level with the corresponding structural bony or cartilaginous architecture can be very helpful (Fig. 7.15).

The separation between bony and cartilaginous dorsum has its value in that the surgeon needs to treat these two "materials" differently at the time of surgery; however, from the point of view of any other observer, such as the patient, the dorsum is best considered as a



► **Fig. 7.14.** The construction of nasofrontal angle can be simply done by drawing (or imaging) two lines. The upper line is based on the mean inclination of the outline from glabella to the radix breakpoint, whereas the lower one is based on the mean inclination of the outline from the radix breakpoint to the supratip area. Nasofrontal angles of similar degrees can be rotated clockwise (**a**) or counterclockwise (**b**) resulting in very different nasal patterns. In the case of a wide nasofrontal angle, the transition from the forehead to the nose is not so evident (**c**)

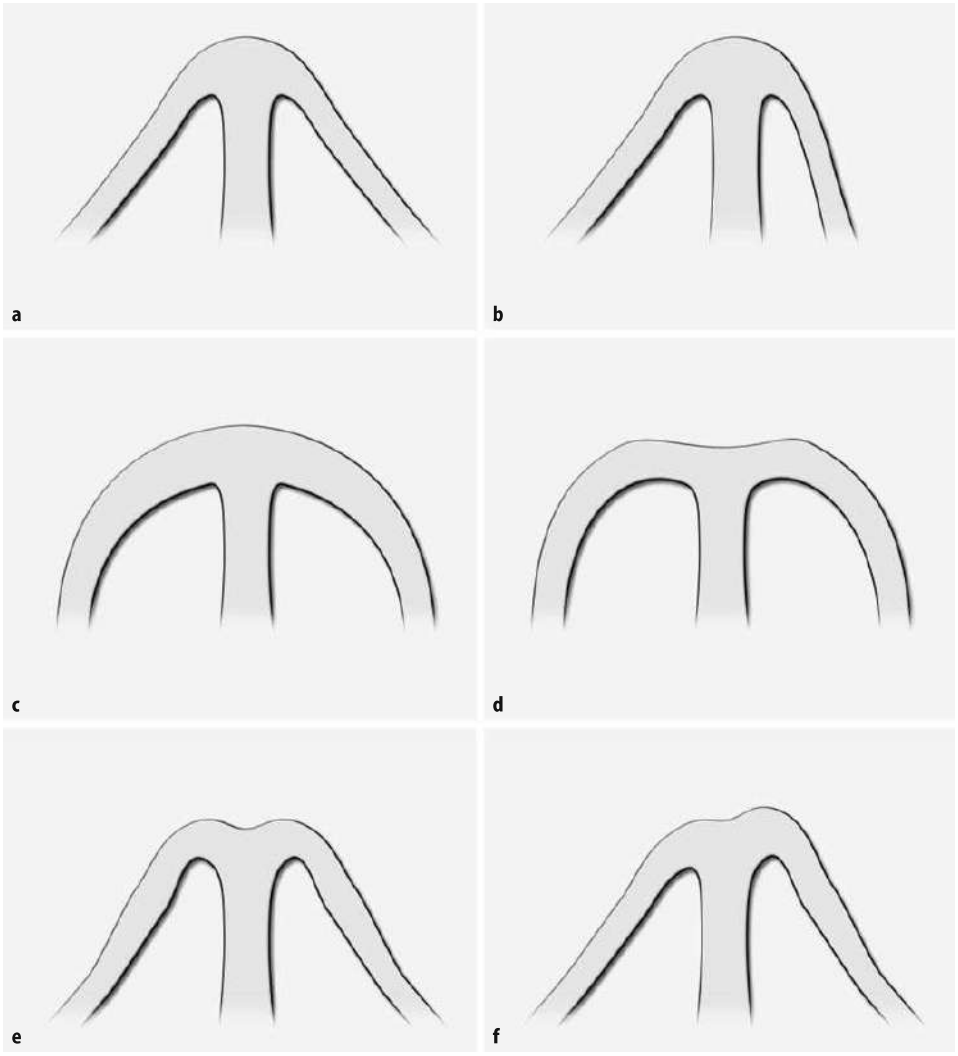


Fig. 7.15. Various types of structural bony and cartilaginous architecture of the nasal dorsum (**a–f**)

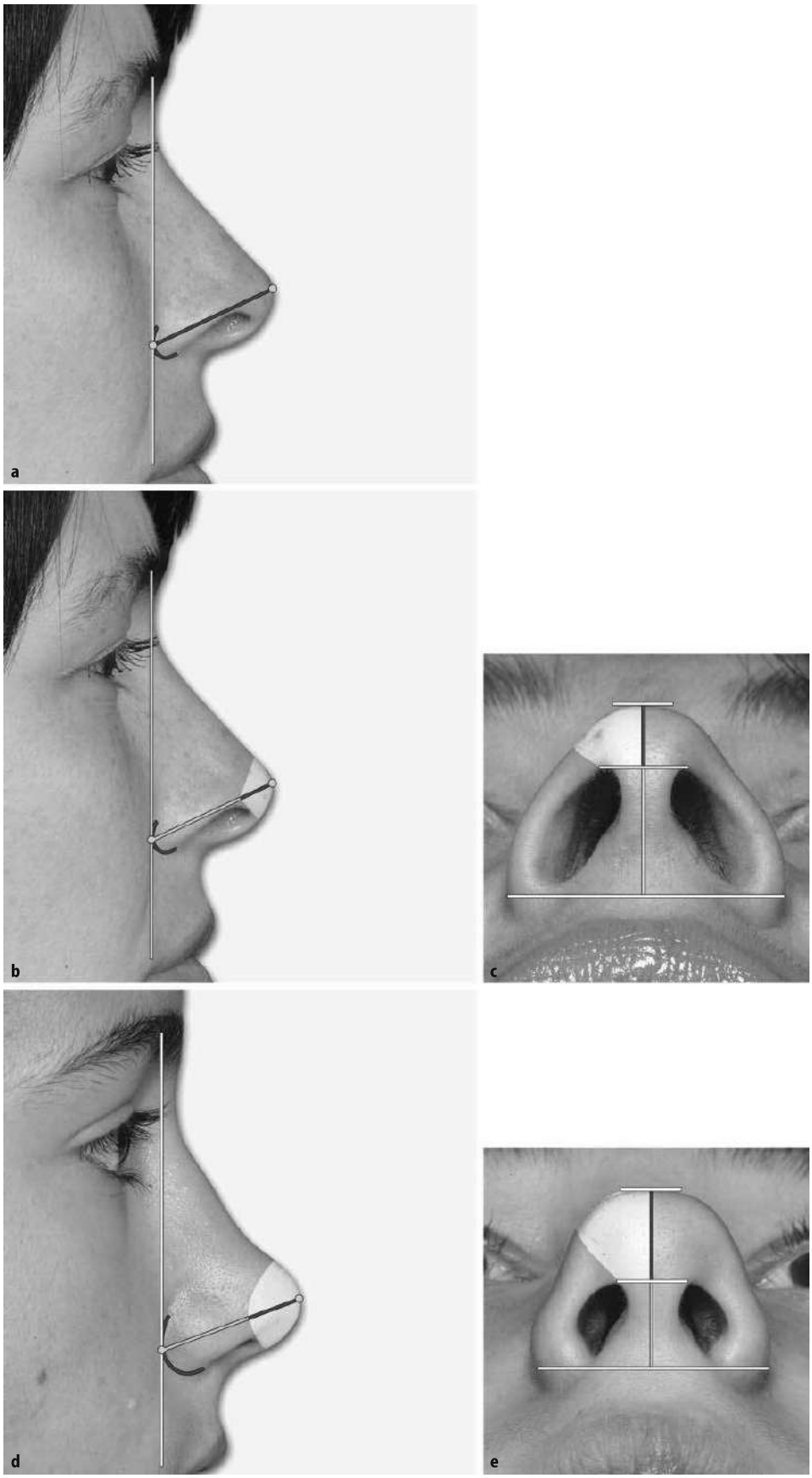
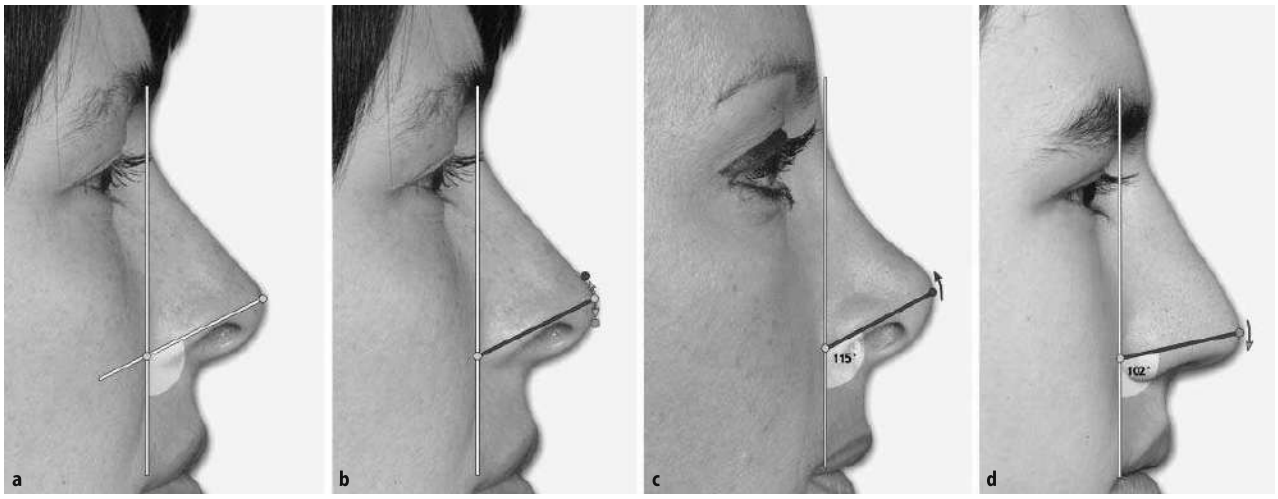


Fig. 7.16.
The tip projection is the distance between the alar crease junction (ACJ) and the most anterior point of the nasal tip (T) and can be divided into intrinsic and extrinsic projections. The intrinsic projection is related to the lobule portion of the tip, whereas the extrinsic projection is related to the length of the ala and the columella (**a–c**). A clinical case in which the total tip projection is mainly sustained by the lobule portion (**d, e**)



▲ **Fig. 7.17.**
The angle of tip rotation is measured between the ACJ-T line and the vertical reference (**a, b**); its normative mean value is 105 degrees for females and 100 degrees for males. A clinical case of an excessive upward rotation in a secondary nasal deformity (**c**) and a normally rotated tip in a male teenager (**d**)

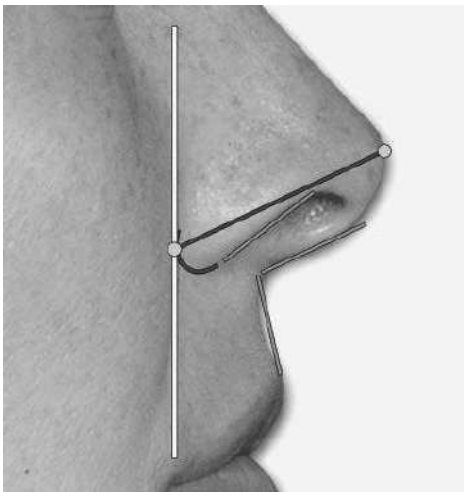


Fig. 7.18.
The tip rotation line compared with the profile lines of the columella, nasal ala and upper lip

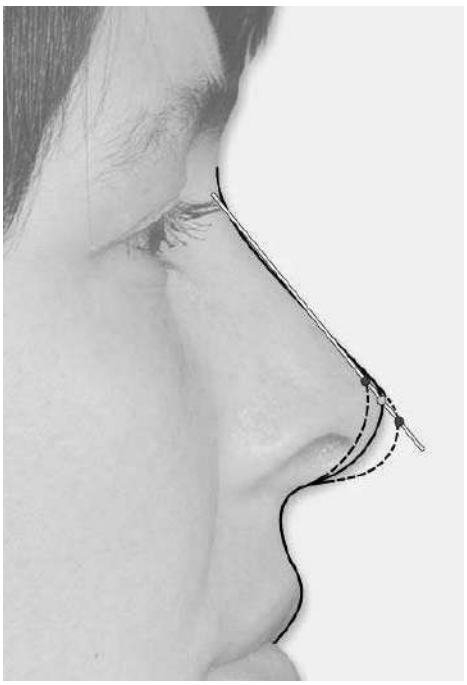


Fig. 7.19.
The tip position assessment refers to the location of the nasal tip along the dorsal line

unique, highly visible structure connecting the radix to the tip.

The great difficulty in assessing the dorsum often lies in the visual influence of the radix and the tip, which are rarely ideal. So, after the general assessment, it is preferable to reconsider the analysis of the dorsum, when the "construction" of the correct radix and tip is done.

7.2.4 Nasal Lower Third Assessment

The clinical assessment of the nasal tip must consider these parameters [4]:

- Projection
- Rotation
- Position
- Volume
- Definition
- Width
- Shape

The tip projection is measured from the alar crease junction (ACJ) to the most anterior point of the nasal tip (T) and can be divided into intrinsic and extrinsic projection. The intrinsic projection is related to the lobule portion of the tip, whereas the extrinsic projection is related to the length of the ala and the columella (Fig. 7.16).

The angle of tip rotation is measured between the ACJ–T line and the vertical reference; its normative mean value is 105 degrees for females and 100 degrees for males (Fig. 7.17). The data obtained by this analysis must be added to those emerging from the evaluation of colume-

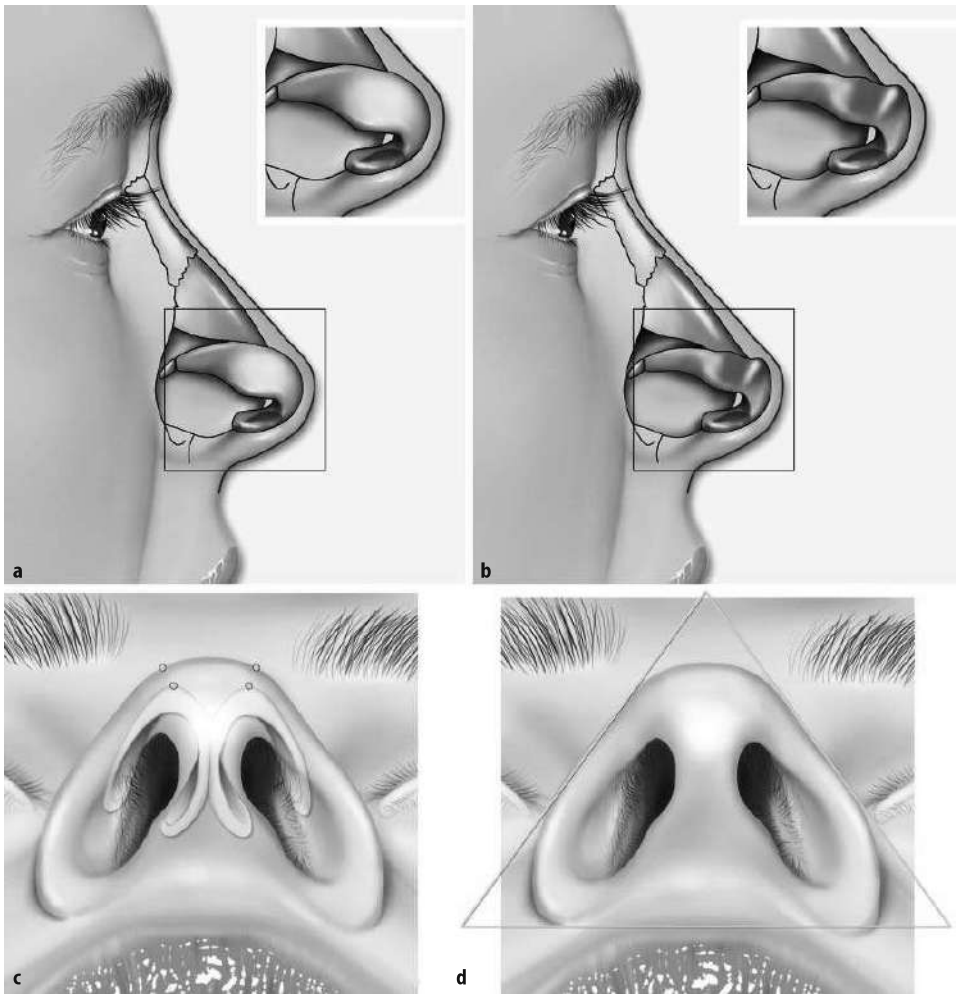


Fig. 7.20.
The tip volume refers to the size of the lobule and is primarily related to the shape, dimension, and orientation of the lateral crura of the lower lateral cartilage (**a**). The tip definition is related to the transition between the most anterior projecting section of the lower lateral crura, the domal segment, and the nearest portion of the lateral crura; to create a well-defined tip the convexity of the dome should turn in a concavity on the lateral crura (**b**). The width of the tip refers to the distance between the paired domes (**c**). In the basal view, the nasal shape considered ideal resembles a triangle (**d**)

lla incline, the alar profile incline, as well as the incline and the length of the upper lip (see also Sect. 7.3) (Fig. 7.18).

The tip position refers to the location of the tip along the dorsal line (Fig. 7.19). This assessment helps in judging the actual length of the nose, as well as any planned surgical modification of the dorsal profile (shortening or lengthening) varying the tip.

The tip volume, definition, width and shape are considered intrinsic characteristics of the nasal lobule [4]. The tip volume refers to the size of the lobule and is primarily related to the shape, dimension and orientation of the lateral crura of the lower lateral cartilage (Fig. 7.20a).

The tip definition is related to the transition between the most anterior projecting section of the lower lateral crura, the domal segment, and the nearest portion of the lateral crura. In particular, at surgery, the convexity of the dome should turn into a concavity on the lateral crura to create a well-defined tip (Fig. 7.20b).

The tip width refers to the distance between the paired domes (Fig. 7.20c).

The classification of the nasal tip based on its external form has produced many shape-related terms such as boxy tip, bulbous tip, and pinched nose. In the basal view, the shape considered to be ideal resembles a triangle (Fig. 7.20d).

Figure 7.21 shows a case of a "boxy" tip deformity that is apparent only in frontal and basal views, whereas Fig. 7.22 illustrates a secondary deformity concerning the whole nose, with a tip defined in the literature as "pinched."

The columellar show is the area of visible columella under the alar rim (Fig. 7.23a). It is best evaluated in profile view and its normal range is between 2 and 4 mm; as well as the measurement, however, the ala and columellar profile

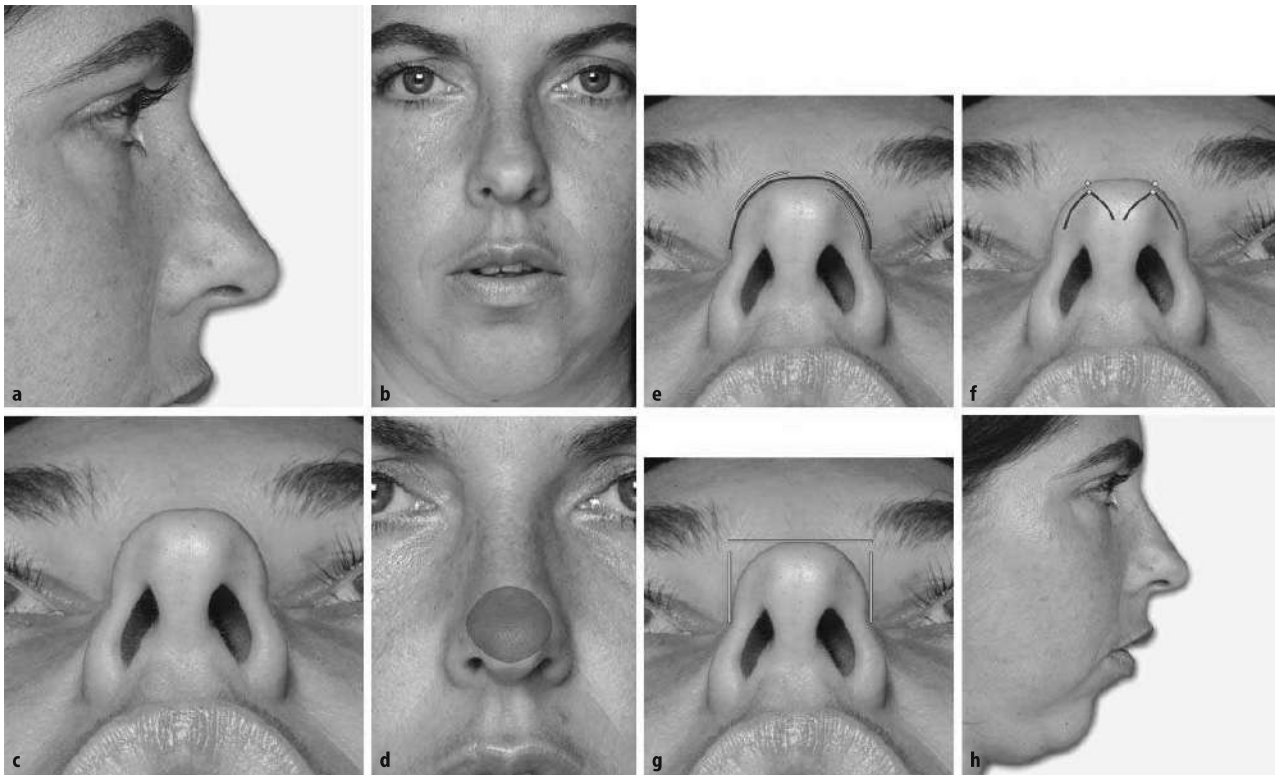


Fig. 7.21. A clinical case of intrinsic tip deformity. In close-up profile view, the nasal outline appears to be quite good (**a**) but the frontal and basal views (**b, c**) show a large nasal tip. The increased volume of the lobule (**d**), the lack of definition and angularity (**e**), the increased interdomal distance (**f**) and a shape, recognized as "boxy" (**g**), characterize this nasal lobule. The full-face profile view permits the surgeon to understand the whole facial imbalance due to the severe class II dentofacial deformity (**h**)

should be analyzed in depth, considering the different combinations of the relationship between ala and columella categorized by Gunter et al. [5]. A reduced columellar show can be produced by a hanging ala (Fig. 7.23b), a retracted columella (Fig. 7.23c) or the combination of these two conditions, whereas an increased columellar show can be produced by a retracted ala (Fig. 7.23d), a hanging columella (Fig. 7.23e) or the combination of these two conditions. The ideal outline of the paired nasal alar rims and the columella, in frontal view, should resemble the figure of a gull in flight (Fig. 7.23f). A different condition, similar to the retracted ala, is the notched alar rim, in which the gentle curvature of the alar outline is lost with the formation of an evident angle (Fig. 7.24).

7.3 The Close Relationship Between the Nose and the Upper Lip

Simply changing the observer's point of view in front of the subject changes the relationship between the columella and the upper lip, the nostril show and also the light reflex over the tip.

Every change in the volume, length, slope, and shape of the lower third of the nose influences how we see the volume, length, slope, and shape of the upper lip. The opposite is also true.

The basic knowledge of the visual interplay between the nasal tip, the columellar–lobule profile and length, the subnasale point or curve, the alar rim profile, the upper lip profile and length, and the labrale superior point can be simplified by altering one parameter at a time. Figure 7.25 shows the visual effects of changing the nasal tip rotation, the upper lip length, the upper lip projection, and the profile contour at subnasale.

The mobility of the lower third of the nose and the upper lip when smiling is always assessed and documented with at least two profile photographs. With a range of movement that differs between cases, the tip of the nose is displaced down and posterior, revealing the inferior dorsal profile of the cartilaginous septum, whereas the ala, at the alar crease junction, rises (Fig. 7.26).

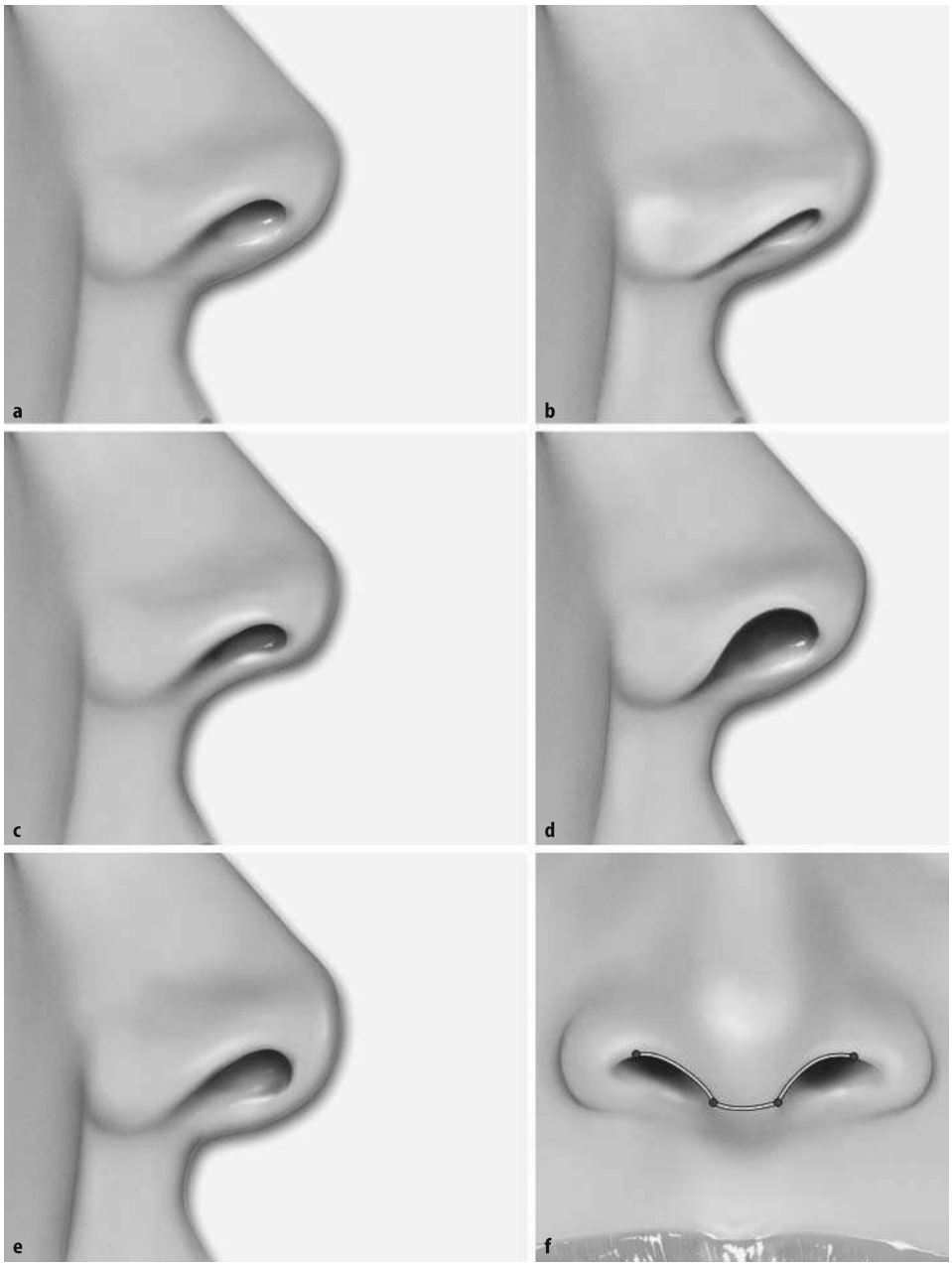


Fig. 7.22. ▲
A secondary deformity following aggressive nasal surgery. In the frontal view, the bilateral dorsal lines are interrupted at the level of the cartilaginous dorsum, the nostril show is increased on each side, and the lobule appears bilaterally pinched (**a**). The oblique right view confirms the distortion of the left "unbroken" line due to the dorsal saddle (**b**). In the profile view, the absence of a radix break-point, the excessive concave dorsal outline, the over-rotated and over-projected intrinsic tip, the retracted right ala, and the long upper lip are evident (**c**). The basal view confirms the pinched aspect of the lobule and reveals the reduction of the right nostril aperture (**d**)

Fig. 7.23.
The columellar show is the area of visible columella under the alar rim (**a**). A reduced columellar show can be produced by a hanging ala (**b**), a retracted columella (**c**) or the combination of these two conditions, whereas an increased columellar show can be produced by a retracted ala (**d**), a hanging columella (**e**) or the combination of these two conditions. The ideal outline of the paired nasal alar rims and the columella, in frontal view, should resemble the figure of a gull in flight (**f**)

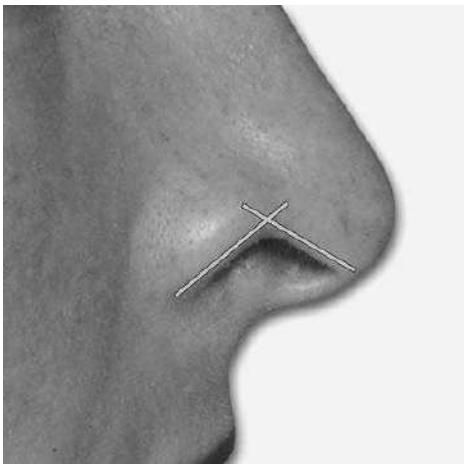


Fig. 7.24.
A clinical case of right notched alar rim. The gentle curvature of the alar outline is lost with the formation of an evident angle

7.4
Nasal Analysis Checklist[1]

To obtain a better analysis of the several nasal parameters and to avoid errors of omission, John B. Tebbetts suggests the use of a checklist [12]. The following one is a good tool for a comprehensive nasal analysis and should be based on the direct clinical assessment along with the 11 basic and the five nasal photographic views, described in Chap. 3. It

[1] Section ❷ of the enclosed CD-Rom

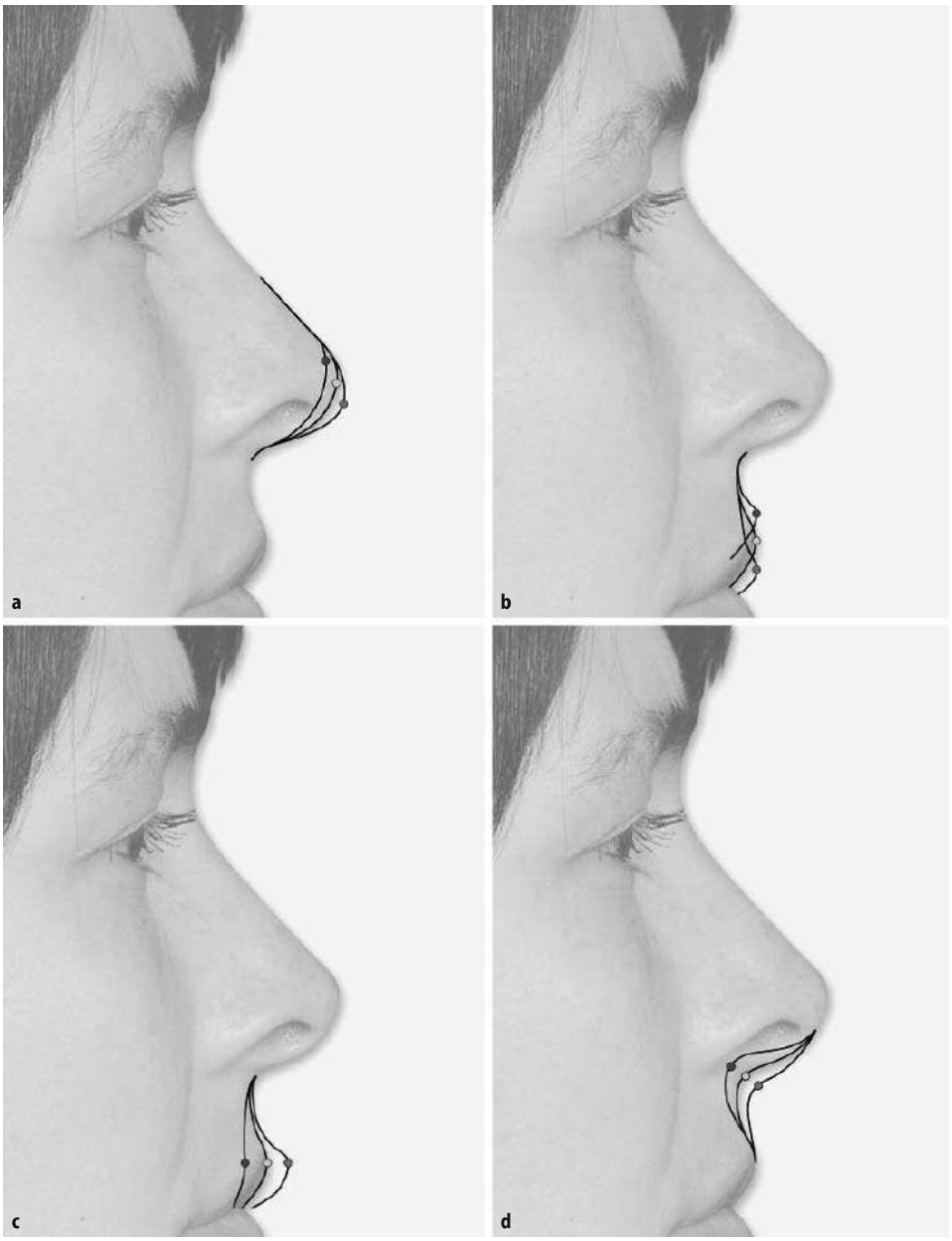


Fig. 7.25.
The visual effects of changing the nasal tip rotation (**a**), the upper lip length (**b**), the upper lip projection (**c**), and the profile contour at subnasale (**d**)

is subdivided into four sections: general considerations, upper third of the nose, middle third of the nose, and lower third of the nose.

7.4.1 Nasal Analysis Checklist – General Considerations

- Is the face symmetric?
  - ❑ Yes
  - ❑ No, because ...
- In frontal view, the facial shape is:
  - ❑ Wide
  - ❑ Narrow
  - ❑ Long
  - ❑ Short
- The facial profile is:
  - ❑ Straight
  - ❑ Concave
  - ❑ Convex
- Define the paranasal region (piriform aperture):
  - ❑ Correct
  - ❑ Hypoplastic (retrusive)
- Is there a dimensional-volumetric balance between the nose and the whole face?
  - ❑ Yes
  - ❑ No, because ...
- Is the nose generally proportioned (balanced) by itself?
  - ❑ Yes
  - ❑ No, because ...
- Define the whole nose:
  - ❑ Large nose
  - ❑ Narrow nose
  - ❑ Long nose
  - ❑ Short nose
- Is the nose symmetric?
  - ❑ Yes
  - ❑ No, because ...
- Are there two symmetric and continuous gentle dorsal curves from the eyebrows to the domal area (nasal "unbroken" lines)?
  - ❑ Yes
  - ❑ No, because ...
- Define the nasal profile slope:
  - ❑ Ideal (balanced with the face)
  - ❑ Slightly downward rotated
  - ❑ Downward rotated
  - ❑ Slightly upward rotated
  - ❑ Upward rotated
- Is the alar base width similar to the intercanthal distance?
  - ❑ Yes
  - ❑ Wider
  - ❑ Narrower
- In the profile view, are the forehead slope, the chin projection, the submental and cervical region balanced with the nose?
  - ❑ Yes
  - ❑ No, because ...
- Define the upper lip:
  - ❑ Balanced with the nose
  - ❑ Too long
  - ❑ Too short
  - ❑ ...
- Define the nasal skin:
  - ❑ Oily
  - ❑ Sebaceous
  - ❑ Thin
  - ❑ Thick
- This nose matches one or more of these definitions:
  - ❑ Tension nose
  - ❑ Pollybeak
  - ❑ Crooked
  - ❑ Saddle
  - ❑ Greek
  - ❑ Pinched
  - ❑ Inverted-V deformity
    (see Sect. 7.8, "Preferred terms," at the end of this chapter)
- Describe the resilience and strength of the supporting tip cartilages (by palpation):
  - ❑ Good
  - ❑ Poor, ...

Fig. 7.26.
The act of smiling produces a specific pattern of movements on the face and nose. From the relaxed position (**a**) to the smiling one (**b**) the characteristic downward displacement of the lobule is associated with the rising up of the ala at the alar crease junction

- Describe any other findings obtained by palpation: ...

7.4.2 Nasal Analysis Checklist – Upper Third of the Nose

- Define the radix width:
  - ❑ Correct
  - ❑ Too wide
  - ❑ Too narrow
- Define the radix break-point in the horizontal plane:
  - ❑ Correct
  - ❑ Too anterior (absent)
  - ❑ Shallow
  - ❑ Deep
- Define the glabella in the horizontal plane:
  - ❑ Correct
  - ❑ Too anterior (due to frontal sinus pneumatization)
  - ❑ Shallow
  - ❑ Deep
- Define the corneal plane antero-posterior location:
  - ❑ Correct
  - ❑ Too anterior (exophthalmos)
  - ❑ Too posterior (enophthalmos)
- Define the radix break-point in the vertical plane:
  - ❑ Correct
  - ❑ Too high
  - ❑ Too low
- Define the nasal dorsum width at the level of the nasal bones:
  - ❑ Correct
  - ❑ Too wide
  - ❑ Too narrow
  - ❑ Deviated to R/L side
  - ❑ Lateral hump on the R/L side
  - ❑ Bilateral lateral hump (double bridge)
- Define the profile over the nasal bones:
  - ❑ Straight
  - ❑ Slight concave
  - ❑ Slight convex
  - ❑ Bony hump
  - ❑ Bony saddle

7.4.3 Nasal Analysis Checklist – Middle Third of the Nose

- Define the base of the middle third of the nose:
  - ❑ Balanced
  - ❑ Too wide
  - ❑ Too narrow
- Define the dorsum of the middle third of the nose:
  - ❑ Ideal
  - ❑ Too wide
  - ❑ Too narrow
  - ❑ Deviated to R/L side
  - ❑ Lateral hump on the R/L side
  - ❑ Bilateral lateral hump (double bridge)
- Define the profile of the cartilaginous dorsum:
  - ❑ Straight
  - ❑ Slight concave
  - ❑ Slight convex
  - ❑ Cartilaginous hump
  - ❑ Cartilaginous saddle

7.4.4 Nasal Analysis Checklist – Lower Third of the Nose

- Define tip projection:
  - ❑ Ideal
  - ❑ Slightly under-projected
  - ❑ Under-projected
  - ❑ Slightly over-projected
  - ❑ Over-projected
- Define tip rotation:
  - ❑ Correct
  - ❑ Slightly downward rotated
  - ❑ Downward rotated
  - ❑ Slightly upward rotated
  - ❑ Upward rotated
- Define tip shape (utilizing the basal view):
  - ❑ Triangular
  - ❑ Boxy
  - ❑ Broad
  - ❑ Bifid
  - ❑ Pinched
  - ❑ Deviated to the R/L
  - ❑ Asymmetric ...
- Define the alar cartilages – interdomal distance:
  - ❑ Normal
  - ❑ Ideal
  - ❑ Wide

- ❑ Narrow
- ❑ Asymmetry ...

- Define the alar cartilages – lateral crus width:
  - ❑ Normal
  - ❑ Large
  - ❑ Small
- Define the alar cartilages – lateral crus rotation:
  - ❑ Normal
  - ❑ Cephalad rotated
  - ❑ Caudal rotated
- Define the alar cartilage – lateral crus shape:
  - ❑ Normal
  - ❑ Deformed ...
  - ❑ Asymmetric ...
  - ❑ R/L differences ...
- Define the nostril show on frontal view:
  - ❑ Correct
  - ❑ Excessive
  - ❑ Reduced
- Define the alar rim:
  - ❑ Thick
  - ❑ Thin
  - ❑ Collapsed
  - ❑ Pinched
- Are the alar rims symmetric?
  - ❑ Yes
  - ❑ No, because ...
- Define the right alar rim arch:
  - ❑ Correct
  - ❑ Hanging
  - ❑ Retracted
  - ❑ Notched
- Define the left alar rim arch:
  - ❑ Correct
  - ❑ Hanging
  - ❑ Retracted
  - ❑ Notched
- Define the columellar show in lateral view:
  - ❑ Ideal
  - ❑ Hanging
  - ❑ Retracted
- Define the columellar-lobule angle:
  - ❑ Ideal
  - ❑ Increased
  - ❑ Decreased
  - ❑ Too anteriorly positioned
  - ❑ Too posteriorly positioned
- Define the columellar length:
  - ❑ Normal
  - ❑ Long
  - ❑ Short
- Define the columellar/lobule ratio:
  - ❑ Correct
  - ❑ Excessive (long columella and short lobule)
  - ❑ Reduced (short columella and long lobule)
- Define the columellar width:
  - ❑ Normal
  - ❑ Wide
  - ❑ Narrow
- Define the medial crus footplates flare (base of the columella):
  - ❑ Normal
  - ❑ Too wide
  - ❑ Too narrow
  - ❑ Asymmetric ...
- Define the nostril aperture shape and orientation in basal view:
  - ❑ Normal
  - ❑ Too vertical
  - ❑ Too horizontal
  - ❑ Asymmetric ...
- Define the alar base width:
  - ❑ Normal
  - ❑ Wide
  - ❑ Narrow
- Define the caudal septum-nasal spine complex:
  - ❑ Normal
  - ❑ Overdeveloped
  - ❑ Underdeveloped (retracted)
  - ❑ Deviated to the R/L
- Define the depressor septi muscle action on the nasal tip:
  - ❑ Normal
  - ❑ Excessive.

7.5 The Nasal Analysis Sheets

There are three ways to create the definitive written nasal aesthetic general assessment.

The first is to utilize a preformed and standardized sheet, like the checklist reported above. The advantages of this tool are: first, it guarantees none of the steps are forgotten; and second, one can use the same comparable method to collect data for every patient, for easy future utilization. It also does not require a computer with printer and relative software.

The second requires the printing of the main photographic views onto large sheets to obtain the necessary ex-

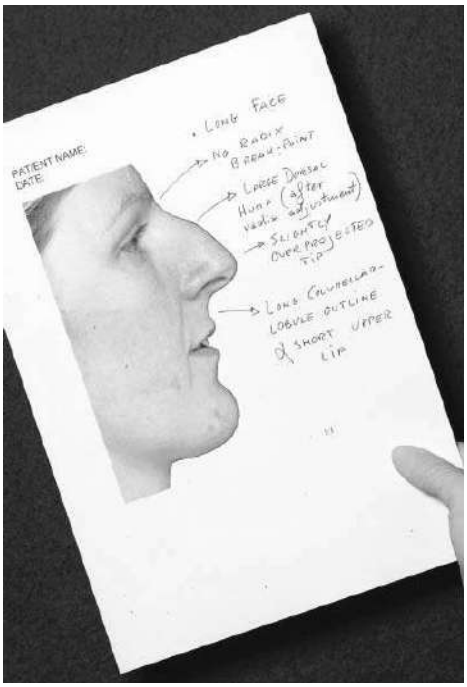


Fig. 7.27. An example of written analysis made directly on the photograph sheet

tra space around every picture for writing the observations (Fig. 7.27). The goal is to correlate the written notes with the photographic images of the patient.

The third and more complete combines the previous two. It offers the possibility of applying the clinical image to an electronic preformed sheet and thus obtains a printed personalized sheet for every patient.

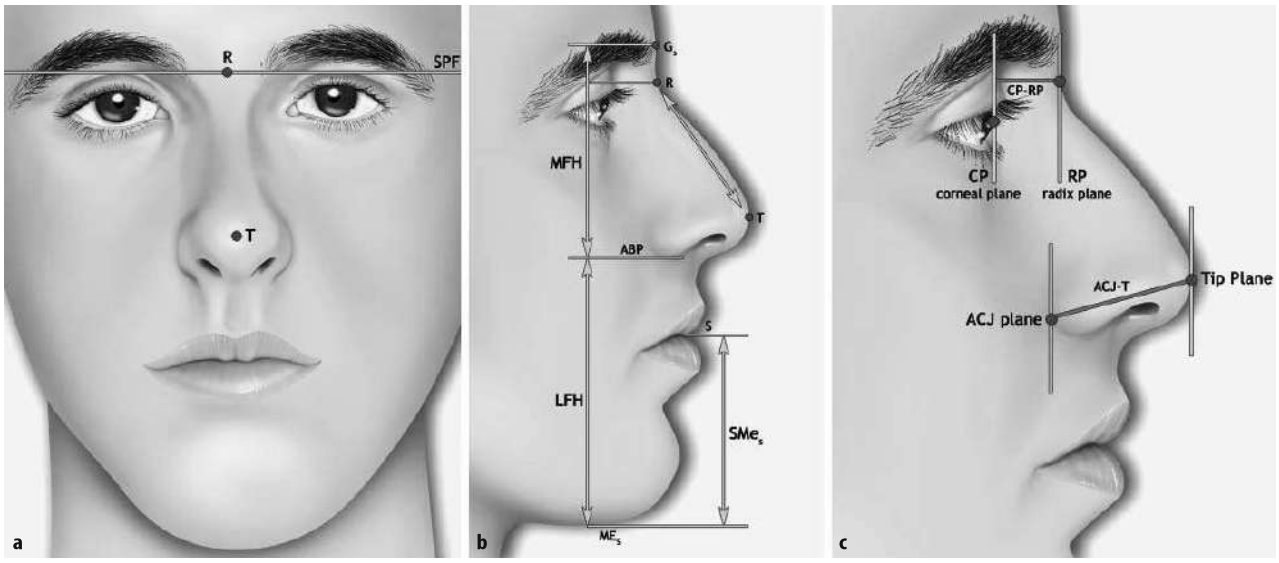
7.6 Cephalometric Nasal Analysis

7.6.1 The Method of Byrd and Hobar

In 1993, H. Steve Byrd and P. Craig Hobar published a useful nasal analysis method for rhinoplasty [2,3]. The main purpose was to determine the aesthetically proportioned nasal length, tip projection, and radix projection in relationship to the patient's facial height. The measurements can be made directly on the patient or, better, utilizing life-size photographs in frontal and profile views.

The main steps of the Byrd and Hobar method are as follows:

- Check occlusion. Exclude, with the intraoral and general evaluation, an underlying dentofacial deformity, such as retrognathic maxilla and retrognathic or prognathic mandible, which require an expanded analytical approach.
- Identify the soft tissue glabella (G_S), the alar base plane (ABP), the soft tissue menton (Me_S), the stomion (S), the alar crease junction (ACJ), the corneal plane (CP), the superior palpebral fold (SPF), the R point, and the T point. Figure 7.28 illustrates all these anatomical and constructed landmarks.
- Measure the midfacial height (MFH) and the lower facial height (LFH). The first is the linear distance from the G_S to the ABP, the second is the linear distance from the ABP to the Me_S (see Fig. 7.28a, b). In a vertical balanced face, the LFH should be equal to or 3 mm greater than the MFH (Fig. 7.28b).
- Measure the chin vertical (SMe_S). This is the distance from the stomion (S) to the soft tissue menton (Me_S) (Fig. 7.28b).
- Measure the actual nasal length (RT) (Fig. 7.28a, b).
- Calculate and draw the ideal nasal length (RT_i) utilizing two different procedures: $RT_i = 0.67 \times MFH$ or $RT_i = SMe_S$.
- Choose between these two measurements the one that is closest to the actual nasal length (RT).
- Measure the actual tip projection (ACJ–T) (Fig. 7.28c).
- Calculate the ideal tip projection, deriving it from the ideal nasal length: ideal tip projection = $RT_i \times 0.67$.
- Measure the actual radix projection, the distance from the corneal plane to the radix plane (CP–RP) (Fig. 7.28c).
- Calculate the ideal radix projection, deriving it from the ideal nasal length: ideal radix projection = $RT_i \times 0.28$. The range is from 9 to 14 mm.
- The ideal radix projection, the ideal tip projection and the ideal nasal length are used to draw the ideal R point and the ideal T point on the profile view. In this way it is possible to envision the "boundaries" of the ideal nose.
- Plan, in agreement with the patient, the desired dorsal profile. As reported by the authors, variation may include



a slight dorsal convexity, a straight dorsum between the radix and the tip, and a straight dorsum reduced to a level of 1–2 mm below the tip, creating retrousse with a supratip break.

In the same papers the authors presented a further step dedicated to the assessment of chin projection [2, 3].

7.7 Nasal Airway Assessment

The external aesthetic analysis must be associated with a complete medical "nasal" history and an anterior rhinoscopy to detect problems related to the nasal airway (see Sect. 13.6). It is interesting that many of the external details found during the aesthetic analysis, such as crooked or saddle dorsum, midline deviation of the nasal framework, narrowing of the base of the nasal pyramid, nostril asymmetry, pinching of the alae, caudal septum deviation, broad columellar base, loss of tip support, excessive down rotation of the nasal tip, nasal skin scars, maxillary hypoplasia, long face, etc. can be a sign of an underlying airway obstruction.

Even if a patient wanting rhinoplasty assures the clinician that her breathing through the nose is good, every effort must be made to reveal any structural cause of obstruction in all the preoperative phases.

Fig. 7.28.
The landmarks utilized in the Byrd and Hobar method on frontal (**a**) and profile views (**b, c**). G_S, soft tissue glabella, the clinically palpable and usually visible anatomic midline point in the lower forehead; this is the most prominent point on the curve of the frontal bone before the nasal-frontal junction. *ABP*, alar base plane, is a plane running through the alar base and utilized as a division between the midface and the lower face. *S*, stomion, is the midline point at the junction of the upper and lower lip vermillion. Me_S, soft tissue menton, is the most inferior midline point on the inferior border of the chin. *ACJ*, alar crease junction, is the most posterior point of the curved line formed by the alar crease as seen in profile view; it is utilized as a landmark for measuring tip projection. *CP*, corneal plane, is a coronal plane tangential to the surface of the cornea in profile view; it is utilized as a landmark for measuring the radix projection. *SPF*, superior palpebral fold, is the vertical reference landmark utilized to identify the *R* point in the midline of the nasal dorsum (the *R* point is constructed and may differ with the existing radix break-point). The *T* point is the midline point on the nasal tip taken at the level of the dome projecting points of the lower lateral cartilages

7.8 Nasal Analysis: Preferred Terms[1]

Many of the nasal terms utilized in this chapter are derived from the Dallas Rhinoplasty Symposium concerning the standardization of the terminology related to nasal surgery. A complete vocabulary for rhinoplasty surgeons was published by Rohrich et al in 2002 [10] and is also available on the web site of the University of Texas Southwestern [7]. This list reports the essential terminology for nasal analysis.

- **Accessory cartilages.** Small cartilages of nasal alae found in the space between the lateral ends of the lateral crura and the pyriform aperture edge.

[1] Section ❸ of the enclosed CD-Rom

- **Alae.** The lateral wall of the nostril that extends from the tip to join the upper lip.
- **Alar crease junction.** The most posterior point of the curved line formed by the alar crease as seen in profile view.
- **Alar base width.** The width of the nose measured at the alar–cheek junction.
- **Alar groove.** The external, oblique skin depression that follows the caudal margin of the lateral crus as it leaves the alar rim to run in a more cephalic direction. It separates the tip from the thickened portion of the ala that joins the face at the superior cheek–lip junction.
- **Anatomic dome.** The junction of the medial and lateral crus.
- **Anterior nasal spine.** The median bony process of the lower rim of the pyriform aperture.
- **Caudal septum.** The free inferior border of the quadrangular cartilage.
- **Caudal.** Means the same as inferior when referring to the nose.
- **Cephalic.** Means the same as superior when referring to the nose.
- **Clinical dome.** The most anterior projecting portion of the lower cartilage. The external projection of the dome is the tip defining point.
- **Columella.** The column at the base of the nose separating the nostrils. Its posterior portion, the columella base, is usually wider.
- **Columellar–labial angle.** Curved junction of the columella with the lip. See also subnasale and nasolabial angle.
- **Corneal plane.** A coronal plane tangential to the surface of the cornea.
- **Crooked nose.** A nose in which any break or deviation of dorsal nasal contour lines may give a crooked or irregular appearance.
- **Deviated nose.** A nose that varies from the straight vertical orientation of the face.
- **Dorsal hump.** A pronounced convexity of the dorsal profile of the nose. Cartilaginous framework, bony framework or both can sustain it.
- **Dorsum of the nose.** Where the lateral surfaces of the upper two thirds of the nose join the midline.
- **Facet.** See soft triangle.
- **Glabella (soft tissue glabella).** The most prominent anterior point in the midsagittal plane of the forehead [9]. It is influenced by pneumonization of the frontal sinus and varies widely in the postero-anterior position.
- **"Greek nose".** A particular nasal profile in which the forehead and nasal dorsum are almost in line and the nasofrontal angle is almost 180 degrees. The radix break-point is excessively projected and difficult to identify.
- **Infratip lobule.** The portion of the lobule between the tip defining points and the columellar–lobular angle.
- **Inverted-V deformity.** Consists of a middle vault secondary deformity in which the caudal edge of the nasal bone is visible in broad relief. It is due to inadequate support of the upper lateral cartilages and/or inadequate nasal bones osteotomy [1].
- **Keystone area.** The junction of the perpendicular plate of the ethmoid with the septal cartilage at the dorsum of the nose.
- **Lower lateral cartilage.** The paired inferior nasal cartilages consisting of the medial, middle, and lateral crura.
- **Nasal base line.** A slightly oblique line on the skin that constitutes the lateral boundaries of the nasal pyramid. The nasal base line starts superiorly near to the medial canthus and ends at the alar crease junction.
- **Nasal lobule.** The lower part of the nose bounded by the anterior nostril edge postero-inferiorly, the supratip area superiorly and the alar grooves laterally.
- **Nasal pyramid.** The bony portion of the nose made up bilaterally of the nasal bone and frontal process of the maxilla.
- **Nasal septum.** The vertical wall that divides the nasal passage into two distinct tunnels. It is composed of a bony (perpendicular plate of ethmoid, vomer, and premaxillary crest), cartilaginous (quadrilateral), and membranous portion.
- **Nasal "unbroken" line.** The outline of the nasal pyramid in oblique view. In the attractive nose, this line descends gracefully from the supraorbital ridge

onto the nasal dorsum and the nasal tip.

- **Nasofrontal angle.** Angle of demarcation between forehead and nasal dorsum, best seen in profile.
- **Nasolabial angle.** The angle seen on lateral view formed by a line drawn through the most anterior to the most posterior point of the nostril, intersecting the vertical facial plane. The desired angle is 90–95 degrees in males and 95–100 degrees in females [10]. Others authors identify the nasolabial angle as the angle defined by the columellar point-to-subnasale line intersecting with the subnasale-to-labrale superior line; the desired angle is 90–120 degrees, more acute in males and more obtuse in females.
- **Nostril sill.** The skin area forming the base of the nostril.
- **Pinched nose (pinched nasal tip).** A nasal tip deformity secondary to collapse of the alar rims subsequent to loss of lateral crural support from either congenital or acquired causes [6].
- **Piriform aperture.** The pear-shaped external bony opening of the nasal cavity.
- **Pollybeak nasal deformity.** Secondary deformity refers to postoperative fullness of the supratip region, with an abnormal tip–supratip relationship [1].
- **Radix.** The area of the junction between the nasal dorsum and the frontal bone, inferiorly to the glabella. The radix break-point is the most posterior point of this junction in profile view.
- **Rhinion.** The most caudal point of the intranasal suture [8].
- **Saddle nose.** A pronounced concavity of the dorsal profile of the nose. Cartilaginous framework, bony framework or both can sustain it.
- **Soft triangle (or facet).** The thin skin fold between the alar rim and the curved caudal border of the junction of the medial and lateral crura. When this is well defined it is referred to as a facet.
- **Subnasale.** The point at which the columella merges with the upper lip in the midsagittal plane [9]. It varies widely in relation to caudal septum prominence and nasal spine morphology.
- **Supratip area.** The area just superior to the nasal tip at the inferior aspect of the nasal dorsum.
- **Tension nose (prominent-narrow pyramid syndrome).** A particular deformity in which the external nasal pyramid is abnormally prominent. The length and the height of the nose are usually greater than normal. The radix break-point is shallow and the nasolabial angle is increased [8].
- **Tip.** The apex of the lobule, but it is frequently used when referring to the lobule.
- **Tip defining points.** The most projecting area on each side of the tip, which produces an external light reflex.
- **Tip projection.** The horizontal component of the distance from the most anterior point of the nasal tip and the most posterior point of the nasal–cheek junction.
- **Tip rotation.** Determined by the tip angle as measured from a vertical line at the alar crease to the tip, with the norms being 105 degrees for females and 100 degrees for males [4].
- **Upper lateral cartilage (or triangular cartilage).** The paired superior nasal cartilages, triangular in shape extending laterally from the dorsal septum making up the lateral walls of the middle third of the nose.
- **Weak triangle (or converse triangle).** Area superior to paired domes where the cephalic margins of the lower lateral cartilage separate to travel in a superior–lateral direction.

References

1. Becker DG (2002) Complications of rhinoplasty. In: Papel ID (ed) Facial plastic and reconstructive surgery, 2nd edn. Thieme, New York, pp 452–460
2. Byrd HS, Hobar PC (1993) Rhinoplasty: a practical guide for surgical planning. Plast Reconstr Surg 91:642–654
3. Byrd HS, Burt JD (2002) Dimensional approach to rhinoplasty: perfecting the esthetic balance between the nose and chin. In: Gunter JP, Rohrich RJ, Adams WP (eds) Dallas rhino-

plasty. Nasal surgery by the master. Quality Medical Publishing, St. Louis
4. Daniel RK (2002) Rhinoplasty. An atlas of surgical techniques. Springer, New York
5. Gunter JP, Rohrich RJ, Friedman RM (1996) Classification and correction of alar-columellar discrepancies in rhinoplasty. Plast Reconstr Surg 97:643–648
6. Gunter JP, Rohrich RJ, Hackney FL (2002) Correction of the pinched nasal tip with alar spreader grafts. In: Gunter JP, Rohrich RJ, Adams WP (eds) Dallas rhinoplasty. Nasal surgery by the master. Quality Medical Publishing, St. Louis
7. http://www3.utsouthwestern.edu/cme/endurmat/rohrich/s9612trm.htm (accessed October 26, 2003)
8. Huizing EH, de Groot JAM (2003) Functional reconstructive nasal surgery. Thieme, Stuttgart
9. Jacobson A, Vlachos C (1995) Soft-tissue evaluation. In: Jacobson A (ed) Radiographic cephalometry. From basics to videoimaging. Quintessence Publishing, Chicago, pp 239–253
10. Rohrich RJ, Muzaffar AR, Oneal RM (2002) Preferred anatomic terms for rhinoplasty. In: Gunter JP, Rohrich RJ, Adams WP (eds) Dallas rhinoplasty. Nasal surgery by the master. Quality Medical Publishing, St. Louis
11. Sheen JH (1978) Aesthetic rhinoplasty. Mosby, St. Louis, p 51
12. Tebbetts JB (1998) Primary rhinoplasty. A new approach to the logic and technique. Mosby, St. Louis, pp 50–51