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CHAPTER 13: PERIORBITAL CONDITIONS IN ETHNIC SKIN

Milind Naik

13.1 Introduction

The face receives maximum attention when it comes to identity and as a sign of youth. Among the facial features, the periocular region is often a candid indicator of age. Periorbital aesthetic concerns, although global, often have certain specific ethnic considerations in a given continent or country.

Ophthalmologists are often consulted for periorbital concerns such as eyelid bags, dark circles under the eye, wrinkles around the eye, and under-eye hollows. The oculoplastic surgeon and the astute ophthalmologist are therefore integral parts of this service provider team. There is an increasing trend to seek non-surgical cosmetic corrections for aging changes as well as to enhance looks.¹ Moreover, many of the complications that arise out of these therapies lie in the purview of ophthalmology.

In this chapter, we describe the relevant periorbital anatomy and discuss the four commonest ethnic considerations in the periorbital region: wrinkles, hills and valleys, nevus pigmentation, and dermatochalasis.

13.2 Functional Periorbital Anatomy

To give aesthetically and functionally pleasing results, it is important to know the dynamic and functional anatomy of the periorbital region. The *eyebrow* is normally at the level

the superior orbital rim in men and above it in women. The male eyebrow is rather flat, whereas the female eyebrow arches higher laterally (Figure 13.1). The *upper eyelid crease* is a critical surgical landmark and is formed by the cutaneous expansion of the levator aponeurosis. Table 13.1 summarizes the differences between upper eyelid anatomy in Asians (Oriental) and non-Asians (Caucasians) and is depicted in Figure 13.1. The eyelid crease is generally 7 to 8 mm above the lid margin in females and slightly lower in males.² The *eyelid fold* is formed by the preseptal skin and orbicularis muscle which is draped over the upper-lid crease. The *orbital septum* extends 360 degrees from the orbital rim, to fuse with the levator aponeurosis, outer tarsal borders, and canthal ligaments. In the Oriental eyelid, the septum is inserted low, and has implications in cosmetic lid surgery.³ The *orbital fat* is contained within the orbit by the orbital septum.⁴ The upper lid has two fat pads (medial and central), with the lacrimal gland occupying the lateral position (Figure 13.2). The lower eyelid has three fat pads (medial, central, and lateral). The inferior oblique muscle originates from the anterior medial orbital floor and separates the medial and central fat pad. A fascial lateral extension of the sheath of the inferior oblique inserts on the anterior lateral orbital rim and separates the central from the lateral fat pad.⁵ The *lower-lid crease* is not as prominent as the upper and is formed by the cutaneous insertion of fibers from lower eyelid retractors. It is usually 2 to 3 mm below the medial eyelid margin and 5 to 6 mm below the lateral eyelid margin.⁵

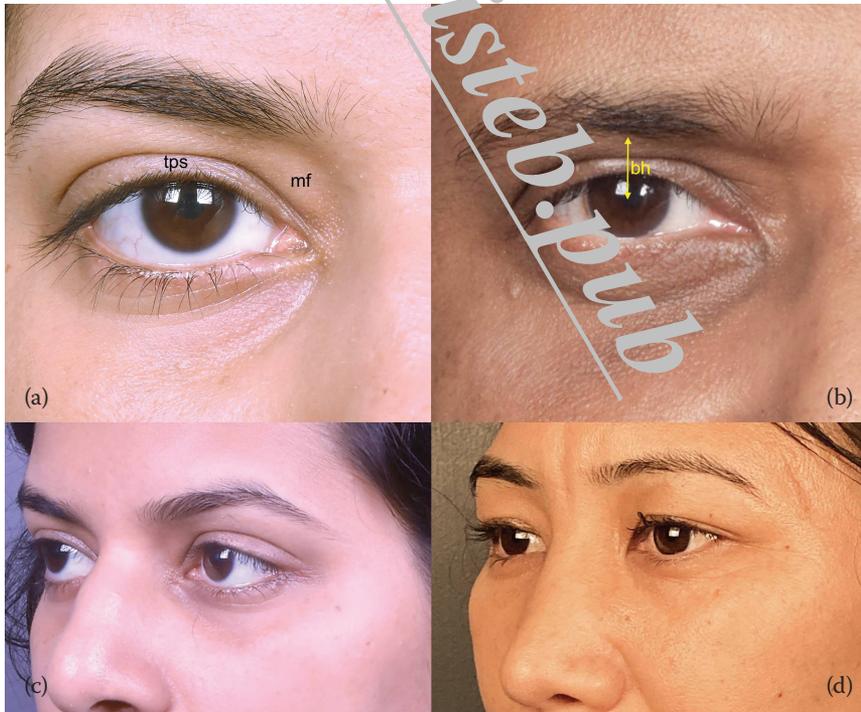


FIGURE 13.1 Differences between a female (a) and a male (b) periorbital region. The female eyebrow arches upward and outward, whereas the male eyebrow is flat, leading to a shorter brow height (bh). In a female, the eyelid crease is higher, leading to a broader tarsal plate show (tps). The medial fat pad (mf) in the upper eyelid is usually a cosmetic concern for the female. Note the differences between Caucasian (c) and Oriental (d) eyelid anatomy.

TABLE 13.1: Anatomic Differences between Caucasian and Asian Eyelids

Anatomic Feature	Caucasian Eyelid	Asian Eyelid
Preseptal fat pad location	Preseptal	Preseptal and pretarsal
Septum-levator fusion point	Above tarsus	As low as the pretarsal plane
Tarsal height	9–10.5 mm	6.5–8 mm
Medial lid crease origin	Medial eyelid	Medial canthus
Presence of crease	100%	50%

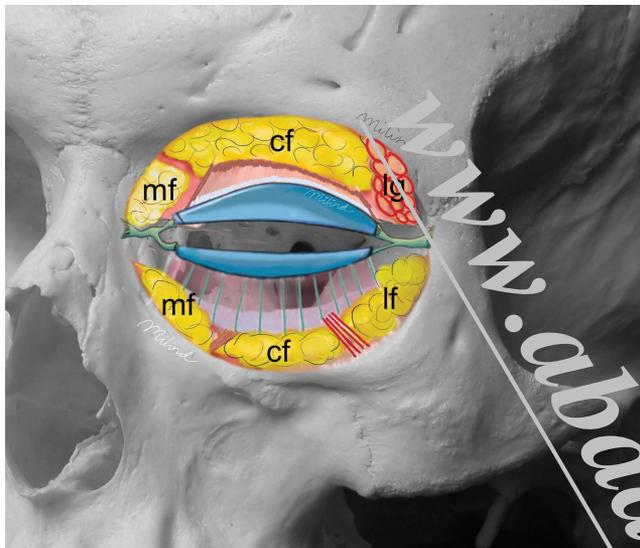


FIGURE 13.2 Periorbital fat pads, left orbit. The upper eyelid has two fat pads, central (cf) and medial (mf). The superior oblique tendon separates the two fat pads. Laterally, the upper lid has no fat pad since that space is occupied by the lacrimal gland (lg). The lower eyelid has three fat pads, medial (mf), central (cf), and lateral (lf). The central and medial fat pads are separated by the inferior oblique muscle. The central and lateral fat pad is separated by lateral raphe, a condensation within the capsulopalpebral fascia.

The junction of the lower eyelid and the cheek is defined by two skin folds.⁵ The *nasojugal fold* runs from the medial canthus down toward the mid-cheek, and the *malar fold* runs from the lateral canthus toward the mid-cheek (Figure 13.3). The lower eyelid retractors fuse with the *orbital septum* approximately 5 mm inferior to their insertion on the tarsal plate.⁶ The medial fat is paler and denser than the central fat pad. The lateral canthal angle is more acute than the medial canthal angle. It is normally 2 mm superior to the medial canthal position (Figure 13.3a).

The concept of negative vector plays an important role in lower-lid treatments. This assesses how far anteriorly the eyeball is placed in relation to the inferior orbital rim (Figure 13.3 b, c). In most patients, a line dropped vertically from the cornea touches the inferior orbital rim. In patients with a negative vector, the inferior orbital rim falls posterior to this line.⁶ These patients may be at risk for lower-lid retraction or hollowed-out appearance post blepharoplasty. Patients of African ethnicity may have genetically prominent eyes and, therefore, a

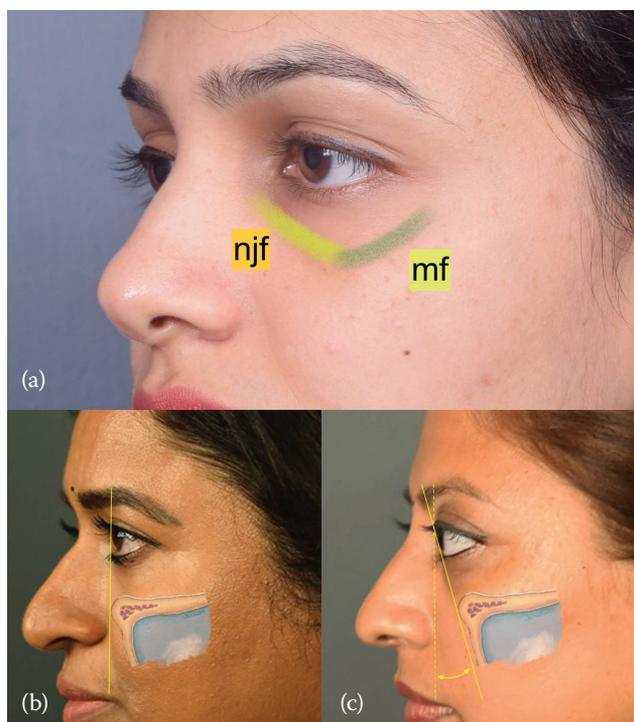


FIGURE 13.3 The lower eyelid merges with the skin of the cheek, with no specific demarcation in youth. The nasojugal fold (njf) runs from the medial canthus along the orbital rim, and the malar fold (mf) runs from the lateral canthus along the orbital rim (a). These two folds deepen with age, giving a tired, hollowed-out look. In a normal person, the plane of the cornea lies behind or is in line with the plane of the inferior orbital rim (b). In patients with a prominent eye (c), the corneal plane is placed ahead of the orbital rim (negative vector). The negative vector provides less bony support to the lower eyelid soft tissues, thereby increasing the tendency to scar downward.

pre-existing negative vector. With this background, let us now discuss the four most common ethnic considerations in the periorbital region: wrinkles, hills and valleys, hyperpigmentation, and dermatochalasia.

13.3 Periocular Wrinkles

Dynamic periorbital wrinkles are caused by contractions of the underlying muscles. The commonest muscles implicated in periocular wrinkles are shown in Figure 13.4. Botulinum toxin can relax the muscles underneath, thereby reducing the overlying wrinkles to provide a younger look.⁷

13.3.1 Crow’s Feet

Crow’s feet are fine or coarse rhytids (wrinkles) originating from the lateral canthus and project outward in a fan-like distribution (Figure 13.5). They are most prominent during the “dynamic” state of smiling or squinting. With age, they may turn into static lines. Several factors accelerate the development of crow’s feet, including sun exposure, smoking, lack of subcutaneous fat, and redundant skin.

An assessment of crow’s feet should be performed at rest and while the patient is smiling. Four types of crow’s feet rhytids

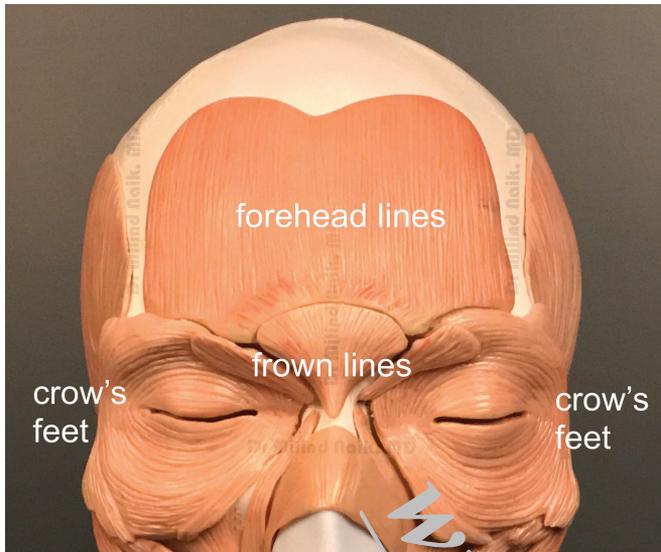


FIGURE 13.4 The muscles targeted for treatment of periorbital wrinkles. Frontalis for horizontal forehead lines, procerus and corrugator supercilia for glabellar frown lines, and lateral raphe of orbicularis oculi for crow's feet. The corrugator lies deep below the orbicularis oculi.

were identified by Kane et al.⁸ A dose of 5–15 units of botulinum toxin type A can be injected per side, subcutaneously, about 1 cm lateral to the lateral canthus (Figure 13.6). The dose can be altered based on gender, muscle function, and the extent of wrinkles. Injection given above the canthal line is close to the lacrimal gland and can induce dry eye in patients with reduced tear secretions.⁹ Similarly, injection given too low to the lateral canthal line can weaken the zygomaticus major, thereby causing smile asymmetry.

13.3.2 Horizontal Forehead Lines

The frontalis muscle is responsible for raising the eyebrows and upper eyelids. This action, over time, results in the development of horizontal forehead lines. Initially dynamic in nature, these lines can become static with age. A dose of 10–20 units of botulinum toxin for women and 20–30 units for men is recommended for forehead wrinkles (Figure 13.7).⁷ The injections are placed in two rows, starting at least 2 cm above the orbital rim, in order to avoid brow ptosis. Side effects include brow ptosis and blepharoptosis.

13.3.3 Glabellar Frown Lines

The glabellar frown lines are caused by the two corrugator supercilia muscles placed horizontally and the procerus muscle placed vertically. They collectively pull the brow medially and downward (Figure 13.8). The corrugator supercilia are horizontally oriented muscle that lie beneath the



FIGURE 13.5 Crow's feet or lateral canthal rhytids can be treated with botulinum toxin injection. These dynamic lines become less prominent after the treatment, and the effect can last for three to four months.



FIGURE 13.6 Sites for botulinum toxin injection to treat crow's feet. Usually, one injection 1 cm lateral to the lateral canthus in the subcutaneous plane is enough (5–10 units of botulinum toxin type A). Additional sites above or below this canthal line can be added based on the extent of the wrinkles.

medial eyebrow, extending outward to about the mid-pupillary line. The procerus is a vertically oriented muscle that lies in between the eyebrows. The glabella is typically treated with five injection sites with a dose of 20–30 units for women and 30–40 units for men (Figure 13.9).⁷ Personal anecdotal experience suggests that, unlike in the West, the Indian patient wants only a reduction in action rather than complete akinesia. Side effects include brow ptosis and blepharoptosis.

13.3.4 Brow Contouring

Apart from wrinkles, Botulinum toxin is also used for facial contouring by altering the balance between two facial muscles. For example, the brow can be reshaped by relaxing the frontalis muscle in the midline and relaxing the orbital part of orbicularis oculi superolaterally to achieve a laterally arching eyebrow (Figure 13.10).

13.4 Periocular Hills and Valleys

The soft tissue contour changes around the eye are best described as hollows and elevations. Hollows require fillers or fat, whereas elevations may require excision where there is an apparent



FIGURE 13.7 Pre- and post-botulinum toxin injection photographs showing the reduction in dynamic horizontal forehead lines.



FIGURE 13.8 Vertical glabellar frown lines formed by the contraction of the corrugator supercillii muscle (a). Significant reduction in the lines following botulinum toxin injection (b). Often, patients are keen to treat the “frown expression” rather than the lines for a more pleasing appearance.

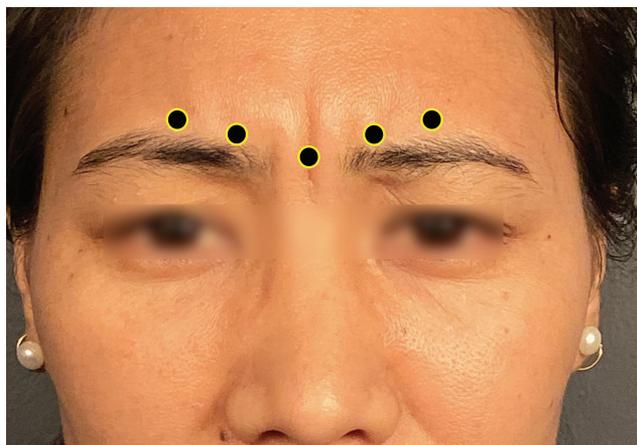


FIGURE 13.9 Botulinum toxin type A 25 units, injected at five sites for the treatment of glabellar frown lines. The central point between the two eyebrows is for the procerus muscle, injected superficially. Two more points on either side, for the corrugator. The lateral most point reaches the mid-pupillary plane to target the tail of the corrugator. Corrugator injections are placed deep, staying above and beyond the orbital rim.

excess. These can be best understood as valleys (hollows) or hills (bags) and are more applicable to the lower-lid aging changes.¹⁰

13.4.1 The Valleys

Starting from the eyelid margin downward, the valleys include the eyelid crease hollow, tear trough, and zygomatic hollow (Table 13.2).

13.4.1.1 Eyelid Crease Hollow

The eyelid crease hollow is formed by the cutaneous attachment of the lower eyelid retractors and represents the surface marking of the lower border of the tarsus (Figures 13.11 and 13.12). It is less prominent than the upper eyelid crease and is bound superiorly by the pretarsal orbicularis roll and inferiorly by the orbital fat prolapse.

13.4.1.2 Tear Trough, or Orbital Rim Hollow

The tear trough hollow is an important feature of eyelid and midface aging. It is a depression along the medial lower eyelid, just lateral to the anterior lacrimal crest and limited inferiorly by the orbital rim.¹⁰ This region corresponds anatomically with the location of the lacrimal sac, hence the term “tear trough” (Figure 13.11).

Tear trough hollow can result from several factors, including loss of subcutaneous fat, thinning of the skin over the orbital rim ligaments, and descent of the cheek. Partial bony resorption of the underlying orbital rim also contributes. While the term “tear trough” would be more appropriate for the younger age group (where it is not an aging change), in the older age group it is aptly termed the orbital rim hollow.

The *orbital rim hollow* corresponds with the location of the orbital rim or orbitomalar ligament. Medially, it is synonymous with the tear trough. Laterally, it follows the circular contour of the inferior orbital rim. In the mid-pupillary line, overlying the infraorbital foramen, the orbital rim hollow widens into a triangular pit (Figure 13.12).

TABLE 13.2: A Simplified Classification of the Hills and Valleys of the Lower Eyelid

Valleys	Hills
Tear trough (orbital rim hollow)	Orbicularis roll
Eyelid crease hollow	Orbital fat prolapsed (fat bag)
Zygomatic hollow	Fluid bag
	Triangular malar mound



FIGURE 13.10 Brow contouring with botulinum toxin. The frontalis is relaxed in the center with 20–30 units of botulinum toxin type A (central red points), thereby moving the head of the brow downwards (a). The orbital orbicularis is relaxed supero-temporally along the eyebrow with 5–10 units of botulinum toxin type A to raise the tail of the brow (green points). This gives an arched, feminine eyebrow without surgery (b).

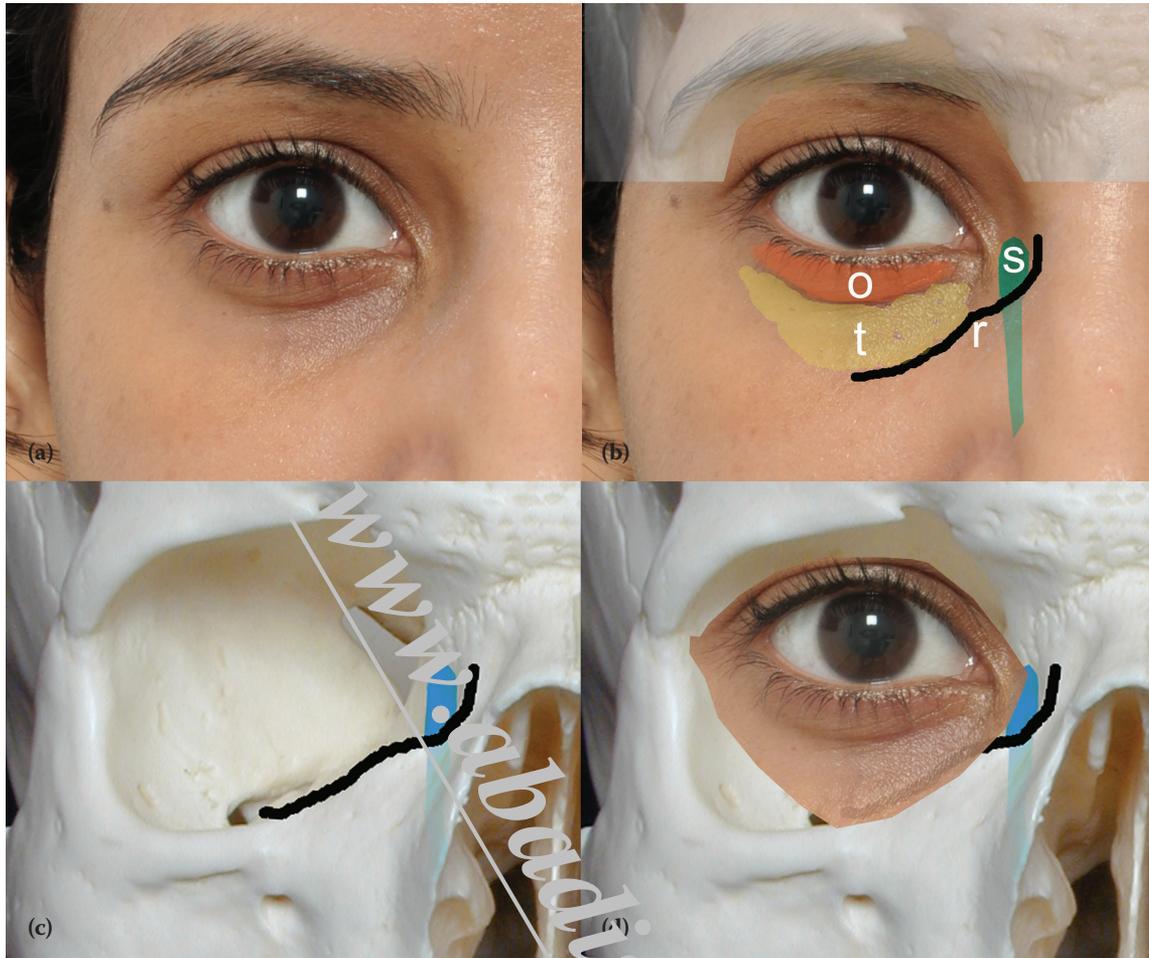


FIGURE 13.11 The right eye demonstrating the hills and valleys around the eye (a). Note the orbicularis roll (o) and the tear trough (t) in relation to the inferomedial orbital rim (r). The lacrimal sac (s) lies medially (bottom left and right), continuing below the orbital rim as the nasolacrimal duct. The tear trough, therefore, does not lie over the orbital rim but often lateral or superior to it.

13.4.1.3 Zygomatic Hollow

It corresponds to the location of the orbitozygomatic ligament (Figure 13.12). It lies along the origin of the levator labii superioris and zygomatic major and minor muscles. The zygomatic hollow is bound by the triangular malar fullness above and by the lateral cheek fat below.¹⁰

13.4.1.4 Significance of the Valleys

The *eyelid crease hollow* is an important landmark of diagnostic significance. It helps differentiate the two hills that are later described in this chapter: orbicularis roll (which lies above it) and fat bag (which lies below it). It does not require treatment.

Among all the valleys, the tear trough (orbital rim hollow) receives the maximum attention with respect to treatment modalities. Hyaluronic acid fillers and autologous fat transfer are the two commonly employed techniques to fill this valley (Figure 13.13). Several commercial preparations of hyaluronic acid fillers are available, along with recommendations for use.¹¹ For fillers as well as botulinum toxin, we now have consensus recommendations that are specific to Indian patients.¹² In the majority of cases, fillers are required in the medial half (medial to the mid-pupillary line). One of the widely discussed and

grave complications of filler injection is blindness caused by retrograde migration of the filler particles, thereby causing central retinal artery occlusion.¹³ It is important for ophthalmologists and aestheticians to be aware of this complication.

The *zygomatic hollow* receives attention with respect to the filling of the malar volume loss. Filling the zygomatic hollow along with the tear trough restores the malar volume and thereby the malar prominence.

13.4.1.5 Brow Deflation

An important area of volume loss (which can be considered as a valley) in the upper eyelid is the loss of brow fat pad. This is most apparent in the central and lateral regions and often leads to an appearance of pseudo-dermatochalasis (Figure 13.14).

13.4.2 The Hills

Starting from the eyelid margin downward, the lower eyelid hills include the prominent orbicularis roll, orbital fat/fluid bag, and triangular malar mound (Table 13.3).¹⁰

13.4.2.1 Prominent Orbicularis Roll

The pretarsal lower eyelid orbicularis roll can be excessively prominent in few, causing a cosmetic concern. It becomes more prominent when the orbicularis contracts during facial



FIGURE 13.12 The left eye demonstrating the three periorbital hollows. The red line marks the eyelid crease hollow that divides the orbicularis roll (above) and fat bag (below). The green line marks the orbital rim hollow. Medially it represents the tear trough. Note the widened triangular pit along the mid-pupillary line. The orbital rim hollow marks the lower limit of the fat bag. The orbital rim hollow can sometimes be visible along the superior orbital rim (light green). The violet line represents the zygomatic hollow, which extends inferolaterally from the midpoint of the orbital rim hollow. The triangular area between the lateral half of the orbital rim hollow and the zygomatic hollow is termed as the triangular malar mound (asterisk).



FIGURE 13.13 Tear troughs are under-eye hollows that can make a person look old or tired. Hyaluronic acid filler was used to fill the hollow. Note the improvement in the apparent pigmentation caused by the shadowing effect.