***PERIORBITAL ANATOMY - AN ESSENTIAL FOUNDATION FOR BLEPHAROPLASTY***

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# ABSTRACT

Background

Mastery of anatomy is fundamental to all surgeons. The anatomy of the eyelids and periorbital regions is unique. Because the eyes and periorbital areas are so essential to cosmetic appearance, blepharoplasty is a popular procedure. Successful blepharoplasty requires thorough knowledge of anatomical concepts. These concepts continue to evolve.

Objective

To develop thorough knowledge of the anatomy necessary to perform blepharoplasty. To understand anatomical relationships and age-related anatomical changes based upon physical examination.

Conclusion

The acquisition of knowledge regarding the structure of periorbital tissues is achievable by cosmetic surgeons dedicated to the best in patient care. Such knowledge results in a mutually beneficial surgical experience for surgeons and patients alike.

*PERIORBITAL ANATOMY - AN ESSENTIAL FOUNDATION FOR BLEPHAROPLASTY*

Comprehensive knowledge of anatomy is fundamental to any successful surgery. The anatomy

of the periorbital region is unique. Successful management of this region requires not only a

thorough knowledge of basic anatomical elements but also how the aging process affects these

structures. The study of anatomy is a dynamic process with development of new insights on an

ongoing basis. Our understanding has increased significantly over the past 20 years. This article

will address fundamental anatomy of the periorbital region.


UPPER EYELID ANATOMY

The upper eyelid can be divided into two layers or lamellae. The anterior lamella consists of

skin, orbicularis oculi muscle and the orbital septum (Figure 1). The orbicularis oculi muscle

can be further divided into pretarsal, preseptal and orbital segments. The pretarsal segment is

responsible for involuntary blink. Preseptal orbicularis muscle causes voluntary eyelid closure

and serves as a lacrimal sac pump. The orbital portion of the orbicularis oculi muscle serves as a

constrictor. It arises from the orbital rim periosteum at the arcus marginalis, a fibrous thickening

along the orbital rim, to merge with the levator aponeurosis 2 - 6 mm above the tarsal plate. It

depresses the brow and contributes to voluntary eyelid closure by opposing the levator palpebrae
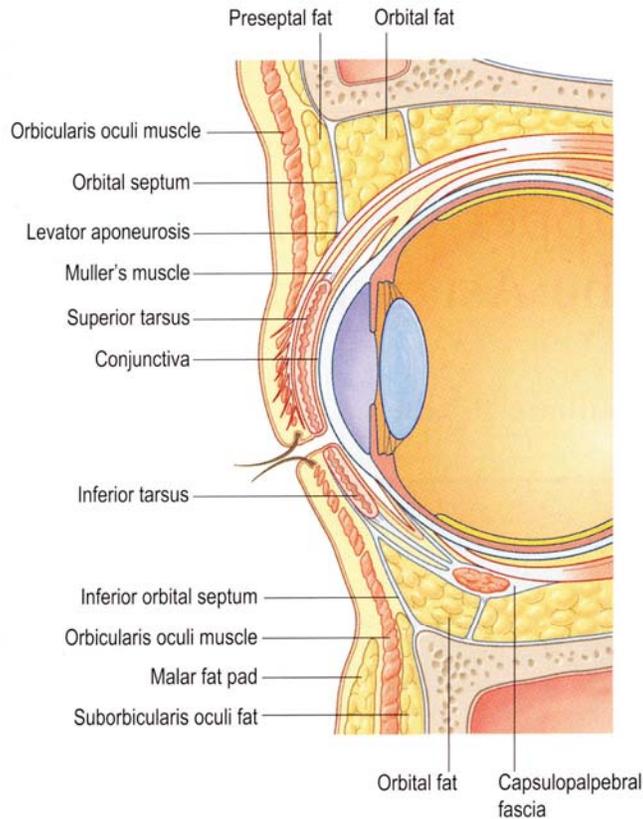
superioris.

Figure 1. Sagittal section of orbital and periorbital anatomy.
(Putterman's Cosmetic Oculopastic surgery, with permission of Elsevier.)

The orbital septum is a thin, whitish fibroelastic membrane. It extends from the arcus marginalis to the levator aponeurosis, usually 2 - 5 mm superior to the tarsal plate. In patients with high eyelid creases, this attachment may be 10 mm above the superior tarsal border.

The posterior lamella of the upper eyelid consists of four components - the tarsal plate, the levator aponeurosis, Müller's muscle and the conjunctiva. The tarsal plate is a dense condensation of connective tissue, which measures 10 mm in height and provides vertical support to the lid. It attaches to the levator aponeurosis and Müller's muscle. The levator aponeurosis represents an extension of the levator palpebrae muscle, the primary elevator of the upper eyelid. Posterior to the levator muscle lies Müller's muscle, which also attaches to the

tarsal plate.  It is under sympathetic control and provides 2 - 3 mm of lid lift.  Horner's

syndrome, secondary to either cervical sympathetic block or thoracic injury, causes lid ptosis due

to this mechanism.  Finally, posterior to the tarsus and Müller's muscle lies the conjunctiva.

Behind the septum rests two fat pads (Figure 2).   The central fat pad is relatively easy to

identify.  The medial pad, which tends to be whiter in color, is more difficult to locate.  It may lie

in a plane posterior to the central fat pad.   What is sometimes thought to be the medial fat pad

may actually be the medial aspect of the central pad.  Lateral to the central pad lies the lacrimal
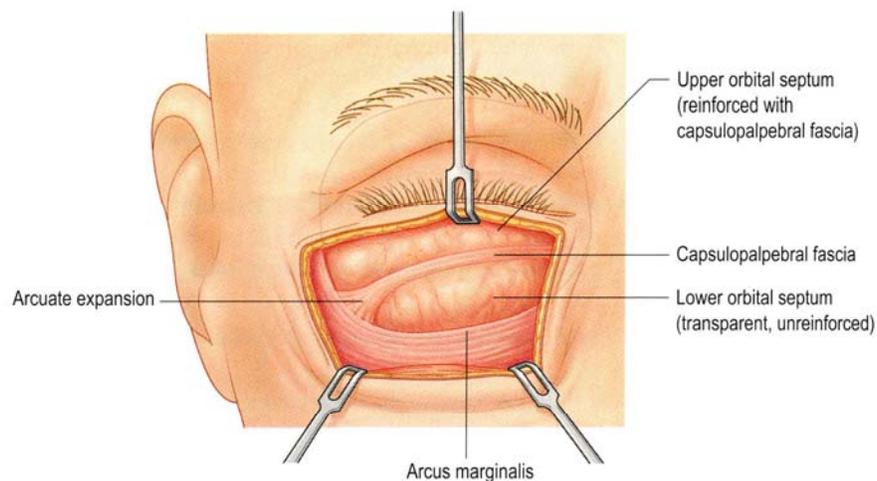
gland.



Figure 3. Relationships between the orbital septum, capsulopalpebral fascia
and the arcuate expansion.

(Aesth Surg J 2001; 21: 450-459, with permission from Sage.)

LOWER EYELID ANATOMY

Similar to the upper eyelid, the lower eyelid is divided into anterior and posterior lamellae.  The

anterior lamella of the lower eyelid consists of skin, orbicularis muscle and the orbital septum.

These structures are generally analogous to those of the upper eyelid. The orbicularis muscle is

attached to the orbital rim via the orbicularis-retaining ligament. These attachments to the orbital rim mark the inferior border of the eyelid.

The lower eyelid posterior lamella is comprised of the tarsal plate, the capsulopalpebralfascia and the conjunctiva. The lower eyelid tarsal plate is smaller than its counterpart on the upper lid, measuring only 4 - 5 mm. The capsulopalpebral fascia represents an extension of the inferior rectus muscle and is analogous to the levator aponeurosis of the upper eyelid. It fuses with the septum superior to a diagonal line that extends from approximately 5 mm inferior to the tarsal plate medially to 10 mm inferior to the tarsal plate laterally (Figure 3). Because the lower portion of septum is not reinforced by the capsulopalpebral fascia, it is weaker and more susceptible to fat herniation.

Three fat pads are traditionally recognized in the lower eyelid - the medial, central and lateral pads (Figure 2). Similar to the upper eyelid, the medial pad tends to be whiter and what may appear to be the medial pad may actually be the medial aspect of the central fat pad. The inferior oblique muscle separates the medial and central fat pads. The inferior oblique muscle is a structure that creates significant anxiety in physicians not experienced in blepharoplasty because it can be damaged during lower eyelid transconjunctival blepharoplasty (Figure 4). The inferior oblique muscle measures 3 - 4 cm in length and originates on the medial aspect of the orbital floor 4 - 6 mm inside the orbital rim. It then travels posterolaterally to insert onto the lateral sclera. Damage is more likely in patients with hypoplastic maxillae and results in diplopia with upward gaze. Because the middle portion of the oblique muscle has a secondary origin at the

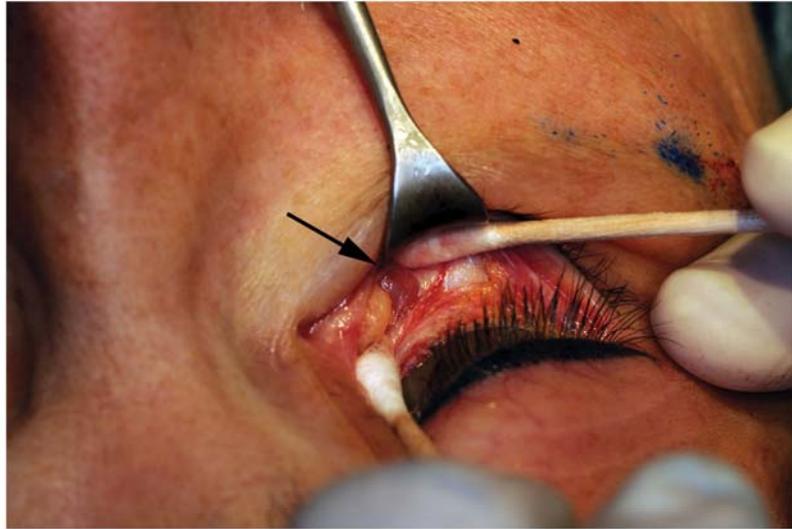capsulopalpebral fascia, damage to the muscle may not result in a functional deficit or may be temporary.



Figure 4. The inferior oblique muscle is exposed between the medial and central fat pads.

Lockwood's ligament, which serves as a supportive hammock for the globe, and the inferior oblique muscle are intimately associated. Fibrous septae from this association form the arcuate expansion which separates the central and lateral fat pads.[1] In one study, the actual distribution of lower lid fat was found to differ significantly from standard teaching.[2] The study describes four patterns of fat distribution in the lower eyelids. In 60% of patients, three encapsulated fat pads were identified as expected. In 11.7%, the medial or lateral fat pads were found to lie beneath the central fat pads. In 26.7%, only two fat compartments were present and one single fat pad was found in 1.7% of patients.

## AGE - RELATED ANATOMICAL CHANGES

A number of studies have addressed age-related anatomical changes that occur in the skeletal and soft tissue components of the periorbital region. The bony elements of the face change dramatically throughout life.[3,4,5] The lower orbital rim recedes relative to the globe. This makes complications such as scleral show and ectropion more likely following lower eyelid blepharoplasty.

Changes in periorbital soft tissues, including components of the lids, muscles, retaining ligaments and skin also contribute to the characteristic appearance of senescence. A series of brow retaining ligaments lengthen with age with resultant inferior descent of the retroorbicularis oculi fat (ROOF) resulting in brow ptosis.[6] The ROOF is a brow fat pad, up to 6 mm thick, located beneath the orbicularis muscle. It commonly descends past the orbital rim and can be sculpted to reduce heaviness of the brow. The combination of upper eyelid levator muscle attenuation and levator aponeurosis dehiscence may contribute to eyelid ptosis. Thinning of the skin and loss of elasticity contribute to dermatochalasis.

The entire lower eyelid complex descends with age due to changes in soft tissue elements.[7] The tarsal plates of the lower eyelids may lose structural integrity and the canthal tendons may become lax. These changes result in lengthening of the lower eyelid margin with subsequent ectropion or scleral show. Thinning and stretching of the orbital septum results in prolapse of fat pads. The preseptal portion of the orbicularis muscle also thins and descends resulting in less support for underlying structures as well as an increased visibility of these structures.

Retaining ligaments crucial to periorbital and cheek support lengthen, contributing significantly to the appearance of aging.[8,9,10,11] The orbicularis retaining ligament extends circumferentially from periosteum near the orbital rim to fascia of the orbicularis muscle. It determines the peripheral extent and shape of lower eyelid fat prolapse (steatoblepharon) and contributes to the formation of the tear trough depression.[12,13,14,15] The orbicularis retaining ligament of the lower eyelid originates not at the orbital rim but 4-6 mm inferior to it.[16] This corresponds to the junction of the preseptal and orbital portions of the orbicularis oculi muscle. Although the orbicularis retaining ligament lengthens with age, it remains tightly bound to periosteum medially at the site of the tear trough depression. This depression contributes to the appearance of a vertically lengthened lower eyelid in senescence (Figure 5). Atrophy and descent of the subcutaneous malar fat pad and the suborbicularis oculi fat pad (SOOF) contribute to the formation of the tear trough (Figure 6), as does thinning of the skin.

Festoons, also known as malar mounds, are characterized by swelling of the skin over the malar eminences (Figure 7). They do not represent steatoblepharon. Instead, they are characterized by laxity or dehiscence of orbicularis muscle and retaining ligaments with focal fluid retention. Festoons extend from the inferior aspect of the lower eyelid above to a groove inferiorly caused by the zygomatico-cutaneous ligament. Festoons may not be obvious when the patient is supine during surgery, only to reappear when the patient is sitting.

CONCLUSION

A thorough understanding of upper eyelid, lower eyelid and periorbital structures is fundamental to achieving desirable, complication-free results with blepharoplasty surgery. Because this

anatomy is unique, special attention must be directed to understanding it and how the various structural components relate.  Furthermore, an understanding of the predictable progression of age-related changes is necessary.  The anatomical concepts of this region will continue to evolve.  Acquisition of new anatomical knowledge will ensure that blepharoplasty surgery will be rewarding for both patient and surgeon alike.

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