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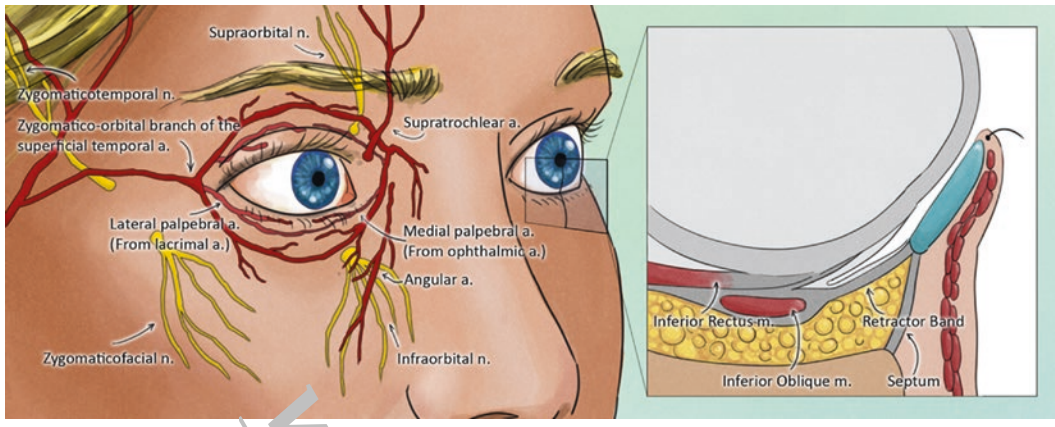

Fig. 4 Major acrteties and sensory nerves in the periocular region (left). Sagittal section of the lower eyelid (right)

flaps on the midface. Long, deep incisions or other trauma between the eyelids and these nodal basins may trap fluid in the eyelid as lymphedema.

10 Innervation

Most of lower eyelid sensation is by the infraorbital nerve, a branch of the maxillary nerve. It courses through the infraorbital foramen between the levator labii superioris and the levator anguli oris muscle. The infraorbital foramen is located above the zygomatic process of the maxilla, approximately 2–3 cm lateral to the vertical midline of the face. It is typically 0.7–1 cm inferior to the infraorbital margin. In most patients, the infraorbital foramen may be located on a line connecting the lateral canthus to the inferior nasal ala at the midline of the face (Fig. 6).

The medial portion of the lower eyelid is innervated by the infratrochlear nerve, a branch of the ophthalmic nerve. The lateral portion is supplied by the zygomaticofacial nerve, a branch of the maxillary nerve. All three of the major cutaneous nerves contain somatosensory fibers.

The orbicularis oculi's motor innervation is supplied by the buccal, zygomatic, and frontal branches of the facial nerve. For the lower eyelid retractors, motor supply is from the oculomotor nerve that simultaneously innervates the inferior rectus muscle.

11 Midface Anatomy

The midface is key in the aging face. Descent and deflation due to sagging tissue and loss of facial fat and bony remodeling are common age-related changes targeted in many rejuvenation procedures. Functionally, the midface supports the lower eyelid. Functional or aesthetic lower eyelid surgery, often requires attention to the greater anatomic structure of the midface.

The midface consists of five basic layers: (1) skin, (2) subcutaneous fat tissue, (3) superficial musculoaponeurotic system (SMAS), (4) deep fat tissue, and (5) deep fascia. The SMAS is a sheet of connective fibrous tissue that encases the muscles of facial expression and allows the facial muscles to function together as one cohesive unit. On the eyelids, there exists no subcutaneous fat and no SMAS (Fig. 7). Instead, the orbicularis oculi muscle is contiguous with SMAS of the midface and occupies the subcutaneous plane. Retaining ligaments extend through the SMAS (from periosteum to skin) and serve as supportive anchors. In the midface, these retaining ligaments are the orbitomalar, zygomatico-cutaneous, and upper masseteric ligaments.

Fig. 5 Inferior oblique medial to to the central fat pad on cadaver dissection

The orbitomalar ligament originates from the periosteum of the inferior orbital rim and extends through the SMAS to insert onto the skin in a fan-like fashion. Because this ligament suspends the inferior periocular skin and subcutaneous tissue, as it loses its elasticity and starts to sag, it delineates the characteristic under eye bag that patients commonly notice with aging.

The most important retaining ligaments of the cheek are the zygomatico-cutaneous ligament and masseteric ligaments. The zygotomatico-cutaenous ligament is a curvilinear true

Fig. 6 Infraorbital nerve (arrow) demonstrated on a cadaver dissection

Fig. 7 Subcutaneous fat (arrow) deep to facial skin. On the eyelid, orbicularis oculi muscle occupies the layer directly beneath skin and orbital fat is deep to the muscle

ligament that originates at the inferior border of the zygomatic arch and extends anteriorly to the junction of the arch and body of the zygoma. The masseteric ligaments are condensations of masseter muscle that also suspend midface tissue.

12 Fat Pads

The facial fat pads should be distinguished from the orbital fat that herniates through the lower eyelid in the aging face. Facial fat can be divided into two categories: superficial and deep

(in relation to the SMAS). The malar fat pad is a superficial fat pad located in the subcutaneous tissue anterior to the SMAS in the malar region. The deep facial fat pads in the midfacial region include the suborbicularis oculi fat (SOOF), buccal fat pad, and deep medial cheek fat. The SOOF is located deep to the orbicularis oculi and above the periosteum of the inferior orbital rim and can be further divided into medial and lateral components. The buccal fat pad is a large, deep fat pad that has three divisions: the anterior, intermediate, and posterior lobes.

13 Vascular Supply

The midface is a highly vascularized region and is mostly supplied by branches of the external carotid artery—more specifically, the angular artery (terminal part of the facial artery), transverse facial artery, and infraorbital artery (branch of the maxillary artery). These arteries and their branches form extensive anastomoses in the midface (Fig. 4).

Venous drainage occurs via the infraorbital vein which drains into the pterygoid plexus, as well as the facial vein.

14 Innervation

Motor function to the muscles of facial expression is supplied by the facial nerve (cranial nerve VII). The buccal branch provides most of the motor innervation to the midface, though the zygomatic branch also helps supply the lower orbicularis oculi. Sensory innervation is provided by the branches of the maxillary division of the trigeminal nerve (cranial nerve V2).

15 Lymphatic Supply

As with the lower eyelid, the medial compartments of the midface drain into the submandibular lymph nodes, whereas the lateral midface drains into the preauricular and deep parotid nodes.

16 Conclusion

The anatomy of the lower eyelid has important relationships to the underlying orbit and surrounding midface. Understanding these structures is key to successful eyelid and facial surgery.

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Clinical Assessment of the Lower Eyelids

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Abstract

The lower eyelid examination is essential for surgical planning. It includes assessment of eyelid position, skin quality, midface anatomy, and the underlying orbit. Eyelid laxity and malposition is characterized by manual testing such as snap back test, distraction test, and forced traction testing. Photographic documentation is essential to document baseline findings as well as to chart progress. This chapter details keys of lower eyelid clinical assessment.

Keywords

Lower eyelid examination · Entropion · Ectropion · Eyelid retraction · Eyelid laxity · Eyelid malposition · Lower eyelid preoperative assessment · Lower eyelid clinical examination

1 Introduction

Clinical assessment of the lower eyelids is multifaceted and requires a clear understanding of the patient's goals and expectations. The history and exam will guide appropriate management. An understanding of the anatomy and physiology of the lower eyelid is important to have in context with clinical findings.

2 History

The pre-operative assessment of a patient with lower eyelid complaints starts with the history. Important components of the history include:

- Chief complaint—what is their primary concern?
- Onset—acute, new, or smoldering problem?
- Prior treatment—surgical or non-surgical—critical for surgical planning
- History of traumatic injury or facial cancer
- Impact on quality of life
- Mitigating or exacerbating factors—especially if the complaint is tearing or discomfort
- Relevant past medical or ocular history—dry eye or tearing
- Current medications—particularly anticoagulants

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3 Physical Examination

The physical examination begins with observing the patient's entire face in room light. A handheld mirror is most useful so the patient can point out their issues.

The upper and lower eyelid height and position, anatomy of the midface, and symmetry are assessed. Measurements such as margin-reflex distance, or MRD, can be obtained by measuring the distance from the margin of the upper eyelid (MRD1) or lower eyelid (MRD2) to the pupillary light reflex. The normal MRD1 measurement is 4–4.5 mm and the normal MRD2 is 5 mm [1] (Fig. 1).

4 Eyelid Malposition

Eyelid malposition, once identified, should be further assessed for the underlying etiology. Entropion, or inward rolling of the eyelid margin, can be congenital, involutional, spastic due to contraction of the orbicularis oculi, or cicatricial due to scarring-induced shortening of the posterior lamella due to injury or inflammation. Ectropion, or outward rolling of the eyelid margin, can be congenital, involutional, paralytic due to facial paralysis, mechanical due to a mass or eyelid edema weighing down the eyelid, or cicatricial due to scarring-induced shortening of the anterior lamella secondary to trauma, prior surgery, chronic inflammation, or contracture from sun damage. Cicatricial changes to the posterior lamella may be present as well. The conjunctiva and fornix should be assessed by everting the eyelid (Fig. 2).

Lower eyelid retraction, or inferior displacement of eyelid margin without ectropion or entropion causing scleral show, should also be measured and an underlying cause sought out if one is not known. Measurement of lagophthalmos is essential in evaluation of the lower eyelid, as it may indicate prior palsy, trauma, surgery, or thyroid eye disease. It is also important to have a high index of suspicion for globe position and consider if proptosis may be causing lower eyelid malposition, which can occur in thyroid eye disease or if the clinician suspects

Fig. 1 Clinical image demonstrating margin-reflex distance (MRD) measurements. MRD1 is demonstrated by an arrow on the right eye as the distance from the margin of the upper eyelid to the corneal light reflection. MRD2 is demonstrated by an arrow on the left eye as the distance from the corneal light reflection to the margin of the lower eyelid