Management of Lower Eyelid Laxity

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KEYWORDS

• Lower eyelid laxity • Blepharoplasty complications • Canthal tightening • Lateral canthopexy • Lateral canthoplasty

KEY POINTS

- Lower eyelid laxity has various etiologies.
- In-office tests assess lower eyelid laxity and help to plan for correction at the time of lower blepharoplasty or to address postoperative lower blepharoplasty complications.
- Many surgical procedures to correct lower eyelid laxity do not address the canthus specifically or may be aggressive and should be reserved for complex reconstructive cases.
- The tarsal strip procedure is exceedingly valuable in patients who have severe laxity and simultaneous lower eyelid malposition, but is not ideal in the aesthetic patient.
- A modified canthal fixation procedure is proposed to address the shortcomings of other techniques and to offer an effective option with excellent long-term outcomes.

Introduction

Management of the lateral canthus is a vital consideration in lower blepharoplasty. Patients who exhibit preoperative laxity, canthal dystopia, or positive vertical vectors are all at risk to have complications with cosmetic lower blepharoplasty and may require modifications from standard technique to ensure aesthetic outcomes. The surgeon must be able to identify these at-risk patients. Similarly, the surgeon must be able to address the postoperative patient who develops lower eyelid ectropion or lateral canthal dystopia after lower blepharoplasty or midface lift.

This article reviews the anatomy of the lateral canthus. We describe the pathogenesis of lower eyelid and lateral canthal laxity, the preoperative assessment, and several procedures that can be used to address canthal laxity and dystopia in blepharoplasty. We also detail the management of the patient who presents with postblepharoplasty lower eyelid retraction.

Lateral canthal anatomy

The lateral canthus lies approximately 1 to 2 mm higher than the medial canthus, and in healthy adults is positioned less than 1 cm from the lateral orbital rim.[1] The horizontal palpebral fissure describes the distance between the medial and lateral commissures and ranges from 28 to 31 mm.[2] The lateral canthal angle is about 6° from a horizontal reference line[3] and measures about 60°.[2] The lateral canthus is a mobile structure: both the lateral horn of the levator aponeurosis, the lower eyelid retractors and the lateral rectus have attachments to the lateral canthal tendon (LCT), and as a result, movements of these anatomic components are translated to the canthus itself.

Unlike the medial canthal tendon, which has a tendinous portion in its anterior component that is anatomically demonstrable, the LCT is not visualized even during open surgery. An indistinct structure anatomically, it nonetheless has solid structural components that give rise to firm fibrous attachments to the lateral orbital rim in healthy patients. These fibrous attachments include the orbital septum, which corresponds to the anterior part of the LCT, and a posterior fibrous attachment to Whitnall's tubercle, a bony prominence approximately 1 cm within the orbit to which most lateral orbital supporting structures attach.[4]

The eyelids are conveniently divided into 3 lamellae: the anterior lamella (the skin and orbicularis oculi muscle), the middle lamella (the orbital septum and orbital fat), and the posterior lamella (the capsulopalpebral fascia and conjunctiva), and, at the lateral canthus, where the upper and lower eyelids meet, there are also 3 lamellae. Each of these lamellae needs to be addressed in reconstructive surgery of the canthus.

The orbicularis oculi muscle encircles the orbit and lies 4 to 6 mm below the dermis at the level of the brow, tapering to less than 0.1 mm at the pretarsal eyelid.[2] Extension of the orbicularis oculi muscle from the orbital rim has been found to be 14 mm superiorly, 12 mm inferiorly, and 25 mm laterally, all measured beyond the rim.[5] Fibrous septa emanate from the dermis and attach to the orbicularis muscle to form the anterior lamella. The orbicularis muscle is divided into pretarsal, preseptal, and orbital portions that envelop the corresponding portions of the eyelid.[2]

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The orbital septum in the lower eyelid has its origin at the arcus marginalis along the infraorbital rim and inserts into the capsulopalpebral fascia or lower eyelid retractors approximately 5 mm below the inferior tarsal border. It is a thin, fibrous layer in contiguity with the retroorbicularis fascia that contains the intraorbital fat compartment.[2] The capsulopalpebral fascia attaches to the inferior tarsal border and envelops the inferior oblique muscle, attaching to the lacrimal fascia and the anterior maxillary spine medially and the lateral canthus laterally.

The primary static support of the lower lid is the fibrous tarsocanthal complex. The tarsus in the lower lid measures approximately 3 to 4 mm in height (compared with 10 mm in the upper eyelid) and 20 mm in length, and is attached medially to the medial canthal tendon and laterally to Whitnall's tubercle.[6]

Secondary lid supports include the lower lid retractors, which help maintain the lid in anteroposterior balance, the orbicularis oculi muscle, which forms a muscular sling around the eyelid and orbital contents, and the globe itself, which prevents the eyelid from tilting posteriorly.[2]

The LCT originates from the lateral aspect of the tarsus, where it is contiguous with the lateral horn of the levator palpebrae aponeurosis. The length of LCT measured from canthal angle to insertion has been found to be 10 mm on average.[7] It inserts as a single limb on the medial aspect of the lateral orbital wall at Whitnall's tubercle, a region 1.5 to 2 mm posterior to the lateral orbital rim. The LCT is a component of the lateral retinaculum and fuses posteriorly with other structures including the check ligament of the lateral rectus muscle, the inferior suspensory ligament of Lockwood, the superior ligament of Whitnall, and the lateral horn of the levator aponeurosis. The posterior limb of the LCT is separated from its anterior component (contiguous with the orbital septum) anteriorly by fat within a compartment known as Eisler's pocket.[2]

Eisler's pocket is a fat-filled recess in the lateral lower eyelids, bounded by the orbital septum anteriorly and superiorly, the LCT posteriorly and nasally, the lateral orbital rim temporally, and the zygoma inferiorly.[8] It is clinically important because, to obtain posterior projection of the LCT in canthopexy, sutures must engage the fibrous tissue behind Eisler's pocket (the posterior limb of the LCT) and not the orbital septum alone.

Pathogenesis of eyelid laxity

Many of the changes that occur at the lateral canthus are involutional. Pessa and colleagues[9] have shown that the lower lateral orbit increases in vertical dimension with aging and that the vertical maxilla shortens and diminishes in projection, allowing the midface to shift inferiorly. This shift may cause the lower eyelid to bow laterally, and may allow the lower eyelid to drift medially and inferiorly with advancing age. Over time, traction on the lateral canthus may attenuate its attachments to the lower eyelid and may contribute to the laxity of the lower eyelid seen in older individuals. Bowing of the temporal lateral aspect of the lower eyelid can distract the lower eyelid from the surface of the globe, resulting in ectropion and in the potential for dry eye symptoms owing to increased exposure.

Cicatrical lower eyelid ectropion and round eye scleral show syndrome can result from aggressive anterior approach blepharoplasty or midface elevation procedures, from overresection of skin, from middle lamella contracture, or from inadequate support of the lateral canthus in patients that are anatomically predisposed.

Certain conditions also predispose to canthal laxity. Floppy eyelid syndrome, the most common subtype of lax eyelid syndromes, is a condition that is seen with increased frequency in patients who are obese and who have sleep apnea. Floppy eyelid syndrome is more common in males, and has been described accompanying keratoconus[10] or hyperglycinemia.[11] Histologically, the tarsus is depleted of elastin adjacent to the lash follicles and the canthal tendons; therefore, both the medial and the lateral tendons are often lax or seem to be dehiscent.[12,13]

Paralysis of the lower eyelid, seen in facial palsies, can give rise to paralytic ectropion of the lid owing to orbicularis atony. Although the lateral canthus is not affected directly by paralytic ectropion, correction of the ectropion often involves manipulation of the lateral canthus.[2]

Assessment

A patient with canthal or lower eyelid laxity may exhibit dry eye symptoms, a foreign body sensation, or reflex tearing owing to eye irritation. However, the majority of patients will be asymptomatic and develop problems postoperatively. It is therefore important to identify the at-risk patient preoperatively.

The evaluation of the patient undergoing lower blepharoplasty routinely involves the assessment of vertical vectors. The patient who might develop eyelid retraction after blepharoplasty will have a relatively prominent eye as compared with the bony maxilla. Many of these predisposed patients have shallow bony orbits, axial myopia, or thyroid eye disease.

In these patients, the lower eyelid may be displaced anteriorly by the prominent eye. The sclera may be visible in primary gaze indicating lower eyelid scleral show. Patients of this sort are said to exhibit *negative vertical vectors*. A negative vector is present when the globe protrudes anterior to the inferior orbital rim (Fig. 1A, B). When a negative vector is present, the lid must support itself against the upward slope of the projection of the eye without bony orbital support. Lid tightening and/or skin excision in this situation may bowstring the lid under the globe and result in a worsening of eyelid position. A positive vector is the opposite situation, where the globe does not project beyond the midface, cheek or inferior orbital rim (Fig. 1C, D).[14]

Transconjunctival surgery, or conservative external blepharoplasty, should be considered as a preferred procedure in high-risk patients with a negative vector. Consideration should also be given to canthal suspension and eyelid support without attempts to tighten the lateral canthus in this group of patients, because an eyelid tightening may produce or exacerbate lower eyelid retraction.

An exophthalmometer is used routinely in our practice to identify and classify positive-negative vector patients. The degree of eye prominence is determined by the position of the globe relative to the bony orbit. Values of 13 to 15 mm using the Naugle-Hertel exophthalmometer are considered within the normal range, and values greater than this are often indicative of a negative vector.[15] Most types of exophthalmometer can provide similar diagnostic information.[16]