Reconstruction of Eyelid Defects

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KEYWORDS

• Eyelid defect • Eyelid reconstruction • Canthus
• Canthopexy • Tarsus • Local flaps

The eyelids serve the critical roles of protecting the globe and maintaining corneal hydration. Even minor eyelid dysfunction can lead to disturbance of visual acuity, and blindness can occur if the disorder allows corneal desiccation. Functionally, the eyelids are highly complex. Gliding over the globe, they aid in cleansing and lubrication by spreading tears across the cornea. They flex in vertical and anteroposterior directions when opening and closing. They maintain elasticity of a degree sufficient to allow their distraction away from the globe, yet they return on relaxation to coapt with the globe and maintain the canaliculi that are opposed to the lacrimal lake. In addition, the eyelids are a component of what is considered to be the most important area of physical beauty. It is not surprising, therefore, that reconstruction of the eyelids is one of the greatest challenges in facial plastic surgery.

This article begins with an overview of eyelid anatomy. This is followed by a discussion of the analysis of normal and pathologic eyelid position, which is a critical task in surgical planning and outcome analysis. It then presents a variety of reconstruction techniques that are useful in correcting the more common eyelid defects that are encountered in a facial plastic and reconstructive surgery practice.

ANATOMY

Successful reconstruction of the eyelids requires a clear understanding of their structural support system, which holds them in position. Although experience with rhinoplasty has taught us much over the last century, failure to maintain or augment this support system when reconstructing the eyelids will lead to subsequent malposition and dysfunction.

The eyelids are composed of three distinct lamellae: the anterior, middle, and posterior. The anterior lamella includes skin and the orbicularis muscle, the middle lamella consists of the orbital septum, and the posterior lamella includes eyelid retractors or elevators, tarsal plates, and conjunctiva. The levator aponeurosis and Mueller's muscle are the elevators of the upper eyelid. The capsulopalpebral fascia and the inferior tarsal muscle are the lower eyelid retractors and are analogous to the elevators of the upper eyelid. Within the posterior lamella, the Mueller's muscle of the upper eyelid and the inferior tarsal muscle of the lower eyelid are absent closer to the lid margin, where the tarsal plates are present (**Fig. 1**). The tarsal plates are composed of dense connective tissue whose posterior surface is lined by conjunctiva. The superior tarsus measures 10 to 12 mm, and the inferior tarsus measures 4 to 5 mm.[1] The tarsal plates are approximately 16 to 20 mm in length and 1 mm thick.

The primary supports of the eyelids are the medial and lateral canthal tendons. Vertical stabilization is provided to the upper eyelid by the levator aponeurosis and to the lower eyelid by the retractors (**Fig. 2**A). The medial canthal tendon (MCT) splits into an anterior limb inserting on the maxillary bone, a superior limb extending to the apex of the lacrimal sac, and a posterior limb (the pretarsal orbicularis, or Horner's muscle) that inserts on the posterior lacrimal crest. The lateral portion of the MCT invests the superior and inferior lacrimal canaliculi. The canaliculi serve to pass

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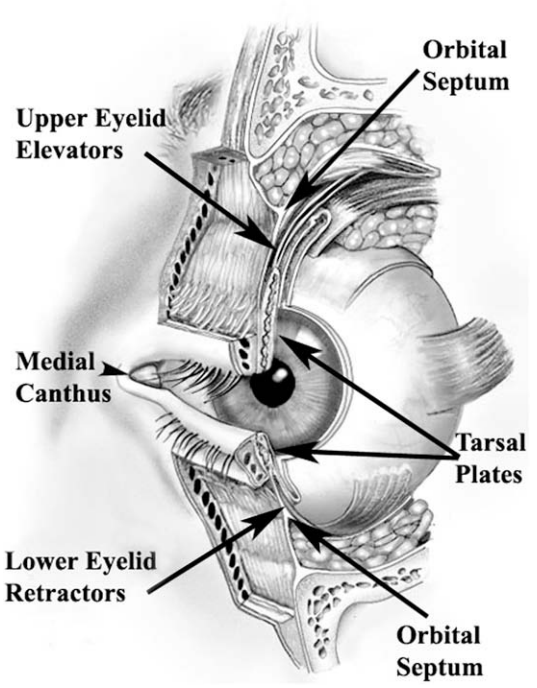

Fig. 1. Illustration of the eyelids, left eye in oblique view, with the skin and orbicularis cut away. Note that the levator aponeurosis and the capsulopalpebral fascia have muscle fibers extending over and attaching to the tarsus and to the orbicularis and skin that have been cut away. The orbital septum found in the middle lamella is the fascia originating from the orbital rim separating the components of the anterior and posterior lamella. (*From* Smith BC, Nesi FA, Levine MR, et al. Smith's ophthalmic plastic and reconstructive surgery. 2nd edition. St. Louis (MO): Mosby; 1998. p. 37; with permission.)

tears from the puncta to the lacrimal sac and are encased by the fibers of the pretarsal orbicularis oculi and the MCT. Interruption of tear drainage will occur if the lacrimal canaliculi are disrupted (**Fig. 2**C).

The lateral canthal tendon (LCT) is formed by dense fibrous tissue extending from the tarsal plates. The LCT holds the tarsal plates posteriorly and superolaterally and inserts on the medial aspect of the lateral orbital wall, 2 mm posterior to the orbital rim, a location that is referred to as Whitnall's tubercle (**Fig. 2**B). The LCT inserts over a vertical distance of 7 mm and is continuous superiorly with the lateral horn of the levator aponeurosis.

Defects in the eyelid support system can result from dysfunction of any of the four components of the support system. As noted, the strongest support is provided by the MCT and LCT. The LCT is the weaker of these structures. The normal LCT provides three-dimensional support in posterior, lateral, and superior vectors. Weakness in the LCT leads to the most common of eyelid malpositions, lateral ectropion.[2] The MCT provides three-dimensional support in posterior, medial and superior vectors.[3] Weakness of the MCT, though rarely recognized, can also occur. This presents as medial ectropion of varied severity, ranging from an increase in the medial canthal height (see later discussion) to frank ectropion with rotation of the inferior punctum away from the lacrimal lake.[4]

Defects in the vertical support system may be more subtle. Weakness of the levator aponeurosis typically manifests as ptosis (descent) of the upper eyelid. Weakness or disinsertion of the lower lid retractor (capsulopalpebral fascia) may result in anteroposterior instability. If there is also an element of anterior lamella retraction, the eyelid may tip away from the globe, arising

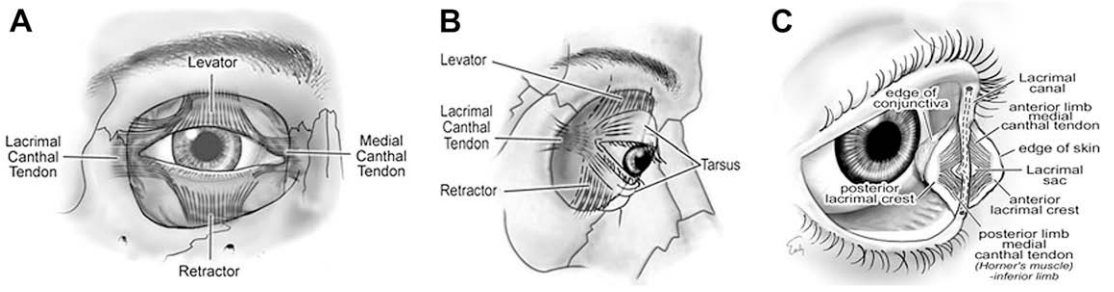

Fig. 2. Illustrations of the eyelid support system showing the eyelid levator, retractor, and the canthal tendons: (*A*) frontal view; (*B*) lateral view; and (*C*) medial view, including lacrimal canaliculi and sac. Note the posterior and superior orientation of the LCT joining the tarsal plates to Whitnall's tubercle inside the orbital rim. (Figures 2A and 2B *From* Moe KS, Jothi S, Stern R, et al. Lateral retrocanthal orbitotomy: a minimally invasive, canthus-sparing approach. Arch Facial Plast Surg 2007;9(6):423; with permission.) (Figure 2C *From* Moe KS. The precaruncular approach to the medial orbit. Arch Facial Plast Surg 2003;5:484; with permission.)