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The Management of an Ectropion and an Entropion for the Comprehensive Ophthalmologist

By Jeffrey J. Hurwitz, MD, FRCSC

An ectropion (where the eyelid margin rolls outward) and an entropion (where the eyelid margin rolls inward) can affect both the upper and the lower eyelid. In the lower lid, the etiology can be cicatricial but, more often, it is due to aging and relaxational changes within the supporting structures of the lower eyelid. In the upper eyelid, however, the condition is almost always cicatricial due to inflammatory and/or fibrotic changes in the conjunctiva or the skin. Over the years, hundreds of procedures have been described in the literature for treating these conditions.[1] Aging changes occurring in the eyelid structures are the main factors leading to the development of a non-cicatricial lower lid ectropion and entropion. An understanding of these changes and the mechanics of eyelid function are important in determining whether the individual patient will develop an entropion or an ectropion.Occasionally, patients present with an entropion that, without surgical treatment, eventually develops into an ectropion. This suggests that there may be a continuum between these two clinical settings. Cicatricial and inflammatory changes involving the conjunctiva can affect the upper lid and/or the lower lid in cases of cicatricial entropion. Similarly, changes in the skin can involve the upper and/or lower eyelid in patients with a cicatricial ectropion.

When a patient presents with an ectropion or an entropion, the ultimate treatment plan should be uppermost in the mind of the ophthalmologist. The most useful approach, with the greatest chance of permanent success, is easily formulated by considering any aging changes, altered pathophysiology, and abnormalities in eyelid mechanics. Although numerous quick and simple treatment procedures have been described in the literature, many fail to give permanent relief of the underlying problem. This is not to say that more complex operations are always indicated, but it appears prudent for the surgeon to undertake the least invasive approach that offers the best chance of a long-lasting cure. This issue of *Ophthalmology Rounds* will help the comprehensive ophthalmologist understand the diagnosis and treatment of these eyelid abnormalities.

Classification

A simplified classification of these conditions will help the surgeon in deciding on the operative procedure of choice.

Entropion (Figure 1): One must distinguish between a true entropion and an epiblepharon. With a true entropion (Figure 2), the lid margin rolls inwards. With an epiblepharon, the anterior lamella tissues push the lashes inward (Figure 3). Isolated trichiasis and distichiasis must be differentiated from an entropion. With distichiasis, there is metaplasia of the meibomian gland orifices and new eyelashes grow from an abnormal posterior location in the eyelid (Figure 4). Trichiasis occurs when the eyelashes come from the usual location of the hair follicles, but they turn inward. In both of these situations, the eyelid margin does not roll inwards and a true entropion does not exist.

A true entropion can be classified as "cicatricial" (Figure 5) or "non-cicatricial" (Figure 2). Noncicatricial entropion can be further subdivided, depending on the amount of increased horizontal lid laxity, as having "increased lid laxity" or "not having increased horizontal lid laxity." This classification is extremely useful for the lower lid. However, in the upper lid, virtually all true entropions are cicatricial.

Ectropion (Figure 6): When considering an ectropion, one must differentiate between a true ectropion (where the eyelid margin is rotated outward) and a retracted eyelid (scleral show;

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Figure 1: Classification of an entropion

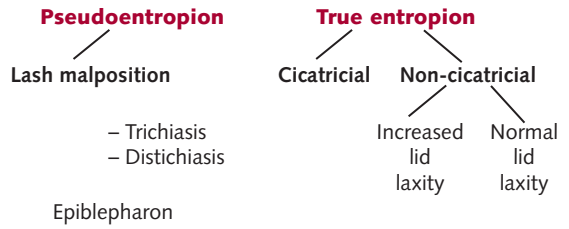

Figure 7), where the lower lid may be pulled inferiorly or the upper lid may be pulled superiorly without a rotation of the eyelid margin. A true ectropion may also be divided into "cicatricial" (Figure 8) and "non-cicatricial" (Figure 9). The cicatricial changes are found in the anterior lamella, usually the skin. In a non-cicatricial ectropion, the treatment differs, depending on the location of the eyelid eversion. A non-cicatricial ectropion may be divided into a "punctal" ectropion (Figure 10) and a "total lid" ectropion (Figure 9). Because an orbicularis weakness may be present in a patient with a non-cicatricial ectropion, a further subdivision of a "total eyelid ectropion" is useful and includes "without facial palsy," and "with facial palsy" (Figure 11). An upper lid ectropion usually tends to be cicatricial (floppy eyelid syndrome is one exception), whereas a lower lid ectropion tends to be non-cicatricial (although secondary cicatricial changes may develop).

This classification is not all-inclusive, but covers most clinical situations and allows the surgeon to formulate a treatment plan.

Aging changes in the eyelid

Aging changes in the eyelid may be divided into 4 regions:

- the eyelid proper
- the supporting structures
- orbital structures (related to lid-globe apposition)
- lacrimal considerations.

Eyelid changes: Eyelid changes may be divided into those that include the skin, orbicularis oculi muscle, tarsus, or conjunctiva. As people age, eyelid skin undergoes atrophic changes that may cause increased wrinkling and loss of support to underlying tissues. Collagen synthesis diminishes with age in eyelid skin.[2] In addition, sun exposure plays a tremendous role in causing the changes seen in aging skin, usually related to solar elastosis of the subepithelial tissues[3] (Figure 12). The orbicularis muscle tends to stretch with age and this is accentuated when individuals wipe their lids in a downward and outward direction, thereby further weakening the orbicularis.[4] It has also been postulated that the pre-septal orbicularis

Figure 3: Congenital epiblepharon

may migrate anteriorly and superiorly to override the more strongly posteriorly fixed pre-tarsal orbicularis. However, this concept is controversial since it is not clear whether the orbicularis actually does migrate primarily or if its anterosuperior position (relative to the pre-tarsal orbicularis) is due to the forward rolling of the lower border of the tarsus in an entropion secondary to disinsertion of the lower lid retractors.[5] The tarsus also tends to lose some of its collagen and may elongate with age.[6] The conjunctiva tends to become atrophic with age, decreasing its goblet cell population, which may become shrunken either as the cause or the effect of a longstanding and chronic catarrhal inflammation.[7]

Supporting structures: The medial canthal tendon and lateral canthal tendon stretch with age, often accentuated by the wiping and rubbing of the eyelids.[6] As well, the supporting structures of the lower eyelid (the capsulopalpebral fascia and the inferior tarsus muscle) may stretch or become detached from the lower border of the tarsus, thereby eliminating normal retraction of the eyelid on depression of the globe.[8] With disinsertion of the upper lid retractors (ie, the levator palpebrae superioris and the superior tarsus muscles), a similar mechanism may occur in the upper eyelid that can lead to ptosis; however, this rarely produces an ectropion of the upper lid unless there is significant cicatricial skin changes. With extreme elongation of the upper lid tarsus and marked stretching of medial and lateral canthal tendons, the upper lid may become quite elastic and a "floppy eyelid syndrome" may develop, in which the upper eyelid margin may indeed evert.[9] A less subtle degree of the floppy eyelid syndrome may occur when the upper eyelid is lax and covers the lower eyelid, so that the lower eyelid lashes rub on the upper eyelid conjunctiva and cause irritation (ie, the eyelid imbrication syndrome).[10]

Orbital structures: The apposition between the eyelid and the globe is important in determining whether it will become ectropic (retracted) or entropic. Classical teaching suggests that, with age, there is atrophy of orbital fat[7] so that, with orbicularis contracture, the lower lid has no

Figure 2: Non-cicatricial, relaxational entropion

Figure 4: Acquired distichiasis due to pemphigoid

Figure 5: Cicatricial entropion (Note: Symblepharon)

support from the recessed globe and, as a result, the lid margin inverts. Studies that have examined exophthalmometry readings and whether they decrease with age have been inconclusive.[11,12] One study evaluating enophthalmos in entropion cases revealed that entropion patients were no more likely to have enophthalmos than normal populations.[13] However, it has been our observation that there is often superior sulcus recession in patients with an entropion, which may explain the orbital fat atrophy that is observed in an anophthalmic socket. Thinning of the orbital septum with age allows the fat pockets to bulge forward into the eyelid, which may affect lid-globe apposition. If a lid tightening procedure is attempted in a patient with exophthalmos, the degree of exophthalmos may be exacerbated, which may further interfere with problems of lid-globe apposition.

Lacrimal considerations: With the development of a mild ectropion, especially medially, the punctum tends to evert and there is decreased tear flow, not only through the lower punctum, but also through the upper punctum (because of the loss of punctal and eyelid apposition on eyelid closure).[14] A decrease in tear flow through the punctum tends to lead to a secondary punctal stenosis. The lysozymes of the tears often cause eczematoid dermatitis on the skin inferior to the punctum and produce a secondary cicatricial punctal ectropion,[15] often exacerbated by irritation from the constant wiping of the tears. A lax eyelid, even if not ectropic, may be the cause of tearing due to lacrimal pump dysfunction.

Pathophysiological considerations in the development of an entropion/ectropion

Atrophic changes

Disinsertion of the lower lid retractors may destabilize the lower border of the tarsus. Therefore, with contraction of the orbicularis – depending on the vertical length of the conjunctiva relative to the skin – the lid margin can turn one way or the other. This is exacerbated by laxity of the lateral canthal tendon and, to a certain extent, by laxity of the medial canthal tendon. If both tendons become significantly lax, then all of the horizontal support of the eyelid is weakened, the eyelid margin everts, and an ectropion

Figure 6: Classification of an ectropion

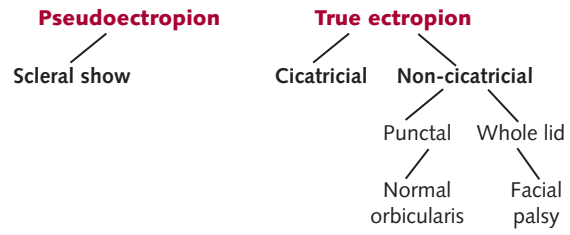

Figure 7: Scleral show and low lower lids after cosmetic blepharoplasty

(rather than an entropion) usually develops. It has been our experience that a non-cicatricial entropion usually has a moderate amount of lateral canthal tendon laxity and a small amount of medial canthal tendon laxity.

Spasticity related to an entropion is secondary and due to the lashes striking the cornea and/or conjunctiva, causing secondary over-action of the orbicularis muscle.[17] In cases where an entropion eventually develops into an ectropion, mechanical rubbing of the eyelid may elongate the medial canthal tendon, thereby causing total loss of eyelid support and making the lid margin turn downwards and outwards. As well, constant irritation from rubbing the skin and changes related to increased tearing may cause cicatricial changes in the skin that ultimately cause the lid to turn outward. Support of the eyelid on the globe would obviously be lost if a relative enophthalmos does exist. A "pseudoentropion" may develop in a proptotic eye, where the lid is not rolled inwards, but the lashes rub the proptotic globe. This often occurs in Graves' disease, in which the punctum itself may become inverted. A pseudoentropion is even more of a problem in Asian patients because the orbital septum is closer to the eyelash line, allowing pretarsal fat to push the lashes into the exophthalmic globe (Figure 13).

The anterosuperior migration of the preseptal orbicularis over the pretarsal orbicularis is questionable and may be secondary to outward eversion of the lower border of the tarsus. Procedures to tighten the preseptal orbicularis over the lower border of the tarsus may cure the entropion secondarily, by preventing an outward roll of the lower border of the tarsus.[18]

Laxity of the orbital septum may allow fat to advance forward into the eyelid (dermatochalasis), and secondarily interfere with lid mechanics and lid-globe apposition. In some situations, the fat may have to be shrunken or excised to restore eyelid mechanics.

Cicatricial changes

Cicatricial anterior lamella changes producing an ectropion of the upper and/or lower lid may be related to

Figure 8: Cicatricial ectropion due to dermatitis causing tightening of the skin

Figure 9: Non-cicatricial entropion with keratinization of conjunctiva

sun damage, previous surgery, or lesions pulling the lower eyelid downward and everting the lid margin. A facial nerve paralysis may exacerbate a lower lid ectropion due to the lack of lower lid orbicularis function, but also due to downward displacement of the upper lid because of eyebrow and forehead droop pushing the lower lid away from the globe. Aberrant regeneration of the facial nerve (upward angulation of the corner of the mouth on eyelid closure) may indicate an incomplete recovery from facial paralysis and should be taken into consideration when repairing an ectropion or when evaluating an epiphora problem related to lacrimal pump dysfunction.[16]

Cicatricial conjunctival changes in the upper and/or lower lid may be due to chronic conjunctival changes (often related to staphylococcus), ocular pemphigoid, symblepharon secondary to glaucoma medication, Stevens-Johnson syndrome, and burns. In the upper lid, trachomatous scarring is probably the most common cause of upper lid cicatricial entropion. More rarely, tumours of the conjunctiva may cause shrinkage of conjunctival tissues, leading to a secondary cicatricial entropion.

Entropion treatment

Conservative nonsurgical management is initially appropriate but, if unsuccessful, surgery is usually indicated. Nonsurgical techniques (eg, taping the lid, lash epilation, injecting the lid with local anesthetic, botulinum toxin, inserting everting sutures, or external cautery) may temporarily help, but surgery is usually necessary to give the greatest chance of a long-lasting cure.

Non-cicatricial entropion with increased lid laxity: One should proceed to tighten the lid. Many different techniques have been advocated, including those aimed at repairing the lateral canthal tendon (eg, the tarsal strip procedure,[21] tendon plication, fashioning periosteal strips, and wiring the lid through holes in the bone). At the Department of Ophthalmology and Visual Sciences, we prefer the modified Bick procedure,[22] a simple procedure that tightens the whole of the eyelid laterally. A full thickness lid resection is performed at the lateral canthus; the tarsus is then sutured to the lateral orbital tubercle using a 3-0 Dexon suture (Davis & Geck). The angle is recreated using a 5-0 Dexon suture. The orbicularis and skin are then sutured in layers.

A study of lower eyelid tightening comparing lid resection (modified Bick procedure) with the tarsal strip procedure revealed that the procedures were equally effective, with the modified Bick procedure much easier to perform.[23] The efficacy of the modified Bick procedure is enhanced when one tightens the preseptal orbicularis over the lower border of tarsus and stabilizes it tightly to the lateral soft tissues. This forms a subtle eyelid crease over the lower border of tarsus and utilizes the philosophy of the Hill-Wheeler procedure[18] to stabilize the lower border of tarsus, without the need for reinserting the capsulopalpebral fascia. One may attempt to reinsert the capsulopalpebral fascia, but it must be refixated exactly to the lower border of the tarsus. If it is too far forward, an ectropion may develop and, if it is too far posterior, an entropion may recur.

Non-cicatricial entropion with no eyelid laxity: This condition cannot be treated with eyelid shortening and is best treated by the Wies procedure.[20] Patients should be able to voluntarily open and close their eyes so there is no under- or overcorrection when the sutures are tied. It is also important to use as little infiltrated anesthetic as possible so the

Figure 10: Punctal ectropion and secondary stenosis

Figure 11: Mild ectropion due to facial palsy with marked aberrant regeneration

Figure 12: Pathology slide showing solar elastosis in skin due to excessive sun exposure, producing cicatricial ectropion

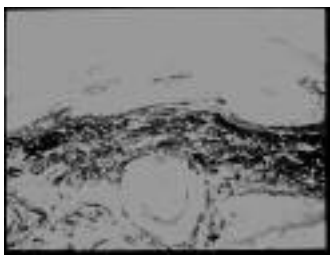

Figure 13: Pseudo-entropion in an Asian Graves patient; lower lid retraction has produced trichiasis

mechanics of the lid are not distorted when tying the sutures to put the lid into its proper position with respect to the globe.

A cicatricial entropion may be treated by an external rotation of the lash line by shortening the anterior lamella (as in an epiblepharon procedure).[19] A skin-muscle horizontal wedge is excised and the lid sutured with deep bites to the tarsus to create an eyelid crease. A more significant entropion would necessitate a horizontal full-thickness incision of the lid with an external rotation of all of the structures below the incision when treating the upper lid and above the incision when treating the lower lid (the Wies procedure).[20] In this operation, a full-thickness horizontal lid-split is performed and the proximal edge of the retractors are sutured to the distal anterior lamella near the lash line. More severe cases of cicatricial entropion may require a mucous membrane graft (of the conjunctiva from the other side, or buccal or lingual mucosa), or an amniotic membrane graft. In cases of ocular pemphigoid, when a graft is utilized, immunosuppression is often required pre-operatively and post-operatively.

Trichiasis and districhiais must be differentiated from a true entropion. Epilation of the lashes, electrolysis, cryotherapy, lid marginal transposition, or even grafting of the lid margin may be used to treat these two conditions. However, if the lashes alone are treated and the lid is indeed entropic, treatment to the lash line may cause increasing cutaneous inflammation and even exacerbate the spasticity related to the pre-existing unrecognized entropion.

Ectropion treatment

Many patients with any form of lower lid ectropion may find wiping the eyelid in an upward direction and massaging the lower eyelid upward helpful. If this does not help, surgery should be considered.

Non-cicatricial ectropion involving the punctum: This condition may be treated surgically by retropunctal cautery or by the removal of a small wedge of the conjunctiva and tarsus posterior to the punctum.[25]

Non-cicatricial ectropion of the whole lower lid: In this situation, the lid is inevitably lax and may be tightened with a modified Bick procedure (as one would do for an entropion with lid laxity). However, as mentioned, the medial canthal tendon is often lax in an ectropion[26] and may need to be tightened. When tightening the lid laterally for an ectropion, it is important that the punctum is not pulled out of the lacrimal lake, or an increase in epiphora may occur. Therefore, one should perform a medial canthal plication primarily, and the lateral canthal tightening secondarily, either at the same time or at a subsequent sitting. If there is ectropion of the whole lid that is more pronounced medially, the lid may have to be tightened laterally and/or medially, and the punctum inverted with a tarsal conjunctival wedge, with or without a 3-snip procedure.

A cicatricial ectropion with skin damage may be helped by conservative measures. Massaging the lower eyelid in an upward direction will often reposition the punctum in the lacrimal lake and decrease tearing. A stenotic punctum may be dilated to increase flow once it is repositioned in the lacrimal lake. If the punctum has been significantly keratinized, a 3-snip procedure (posterior wall punctectomy) may be performed.[24] With a non-keratinized everted punctum, repositioning and dilatation is usually all that is necessary. If the conjunctiva is everted and keratinized (Figure 9), it is useful to massage the lower lid in an upward direction with a steroid ointment. This not only softens cicatricial skin, but also decreases keratin on the conjunctival surface that could cause irritation when the lid is repositioned. Occcasionally, keratin has to be removed with a curette or even excised.

A cicatricial ectropion may be treated by minor plastic techniques (eg, z-plasty); however, in more severe cases, extra skin is often needed to replace the skin deficiency. A flap may be rotated from the upper lid to the lower lid to give a vascularized pedicle either medially or laterally, or a free graft may be taken from behind the ear or the upper lid on either side. Occasionally, a lid tumour that pulls down the lid will be the cause of the ectropion. Removing the tumour will alleviate the ectropion.

When a facial palsy is present, a tarsorrhaphy is useful to protect the cornea; however, if the lid is also lax, it may be necessary to tighten the lid and perform a tarsorrhaphy simultaneously.[27] Often, static procedures such as medial and/or lateral wedge resections or lid-tightening procedures will help lid-globe appositional problems. A full-thickness medial lid resection may be performed, but this will invariably damage the canaliculi. This may be inconsequential since the canaliculi are often non-functional in the facial palsy scenario. Dynamic techniques such as springs, encircling bands (static and dynamic), gold weights, and re-animation procedures can be utilized in selected cases of facial nerve paralysis.

It is important to differentiate an ectropion of the lower lid from a lower lid retraction. In a lower lid retraction, the lower lid must be elevated vertically as well as tightened horizontally. In a mild lower lid retraction, disinsertion of the lid retractors may elevate the lid. In more severe lid retraction, the insertion of spacers (eg, scleral grafts, hard palate grafts, tarsal conjunctival grafts, cartilage grafts, etc.) are usually indicated. Once the lid is elevated to a proper position, the surgeon can ascertain whether the lid should also be shortened horizontally. With laxity of

the whole upper lid (floppy eyelid), a tarsorrhaphy may help, but a full-thickness lid resection provides a more permanent cure.

Conclusion

The management of an ectropion and an entropion in the adult patient is facilitated by a good understanding of the pathophysiological changes in the aging eyelid. Lack of treatment can lead to irreversible corneal changes. Although conservative measures are often helpful or even curative, surgery is indicated in many patients. The simple classification system presented in this issue should help the comprehensive ophthalmologist in treating these entities.

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Nov. 23, 2006	VPP Dr. Alan Bird, London, England "AMD"
Nov. 30, 2006	VPP Dr, Jose-Luis Tovilla, Mexico City, Mexico "Facial Palsy"
Dec. 8-9, 2006	Walter Wright Day, The Old Mill Inn, Toronto, Ontario Update in Medicine and Ophthalmology Contact: CME Office – 416-978-2719
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