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The Diagnosis and Management of Epiphora when the Lacrimal Drainage Pathways are Patent

BY JEFFREY JAY HURWITZ, MD, FRCSC

When a patient presents with symptoms of tearing, the diagnosis that usually springs to mind is that of a blocked tear duct. However, most patients with symptoms of tearing do not have blocked tear ducts and the etiology is something else. Patients with symptoms of tearing with a patent lacrimal system are classified as having a "functional obstruction," and treatment can be quite controversial and varied.^{1,2} However, with a careful history and physical examination and, occasionally, the addition of a radiological lacrimal investigation, the diagnosis can be reached and the appropriate treatment undertaken. This issue of *Ophthalmology Rounds* provides a comprehensive overview of the different causes of epiphora, including the oversecretion and decreased elimination of tears, particular eyelid abnormalities, and therapeutic options in those patients with a patent lacrimal system.

Patients with symptoms of tearing can be divided into two groups:

- those with an over-secretion (lacrimation) of tears, and
- those with insufficient drainage of tears, either due to an eyelid problem or a lacrimal drainage system problem.

Patients with symptoms of tearing and a patent lacrimal system may still have an anatomical stenosis in the system that is sufficiently significant to cause symptoms of tearing. Normally, there should be a steady state wherein the elimination of tears should equal the production of tears. If there is increased secretion of tears with no change in elimination, the patient will have symptoms of tearing. Similarly, if there is decreased drainage of tears and a normal secretion of tears, tearing will also be a predominant symptom. A true dry-eyed situation may develop with decreased secretion of tears and/or increased elimination of tears (Figure 1).

Oversecretion of tears (lacrimation)

The oversecretion of tears may be due to either a local or central phenomenon. Local phenomena causing tearing may be asthenopia, related to eyestrain or refractive problems, any external disease (conjunctivitis, keratitis, foreign body, etc. Figure 2), eyelid abnormalities (blepharitis), or eyelid abnormalities causing increased exposure (ectropion) or Graves' ophthalmopathy with lid retraction. Also, aberrant eyelashes in a situation such as trichiasis (Figure 3) and entropion (Figure 4) may cause irritation with increased secretion of tears. What is characteristic in the symptomatology of these patients is that there are other symptoms in conjunction with tearing (Figure 5). If there is itchiness, there is the possibility of an ocular allergy. If there is grittiness, there may be a problem with surfacing of the tears related to lid retraction in a thyroid patient or a tear film abnormality in the keratitis sicca patient. If there is discharge as well as tearing, one must look carefully for a conjunctival disease.

Central causes of tearing may be due to any irritative phenomenon along the neurophysiological pathways in the secretion of tears. As well, there may be psychogenic causes of tearing; the connection with the phenomenon of "crying," is not fully understood.

"Wet eyes due to dry eyes" is a definite cause of tearing due to a hypersecretion of tears. This phenomenon is often misinterpreted, leading some practitioners to prescribe artificial tears for patients with symptoms of tearing. With an abnormality of the tear film, specifically of mucin produced by conjunctival goblet cells, there may be poor spreading of tears across the cornea. Also, if there is a deficiency or abnormality in oil secretion by the meibomian



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Ophthalmology and
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Department of Ophthalmology
and Vision Sciences

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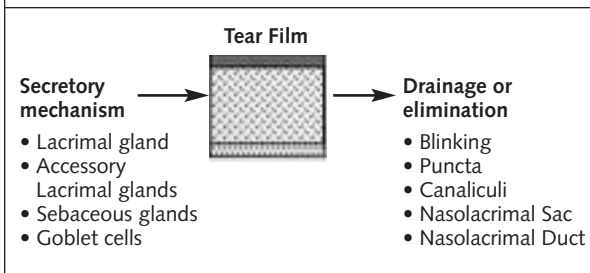
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Ophthalmologist-in-Chief

Department of Ophthalmology
and Vision Sciences,
Faculty of Medicine,
University of Toronto,
60 Murray St.
Suite 1-003
Toronto, ON M5G 1X5

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Figure 1: The normal balance between secretion and tear elimination



glands, there may be an increased evaporation of the tears, which also leads to a surfacing problem. This "dry eye" situation can cause, via a reflex arc going back to the lacrimal gland, stimulation to increase the secretion of tears in order to wet the cornea. Because this increased secretion does not increase the mucin or oily components of the tear film, it leads to tears running down the cheeks, paradoxically producing a "wet eye" in a "dry eye" situation. Indeed, the treatment in this situation is an artificial tear substitute that can effectively increase the mucin and/or oily components of the tear film, thereby decreasing stimulation via the reflex arc to cause increased tear secretion.

Management of the over-secretion of tears

A full ophthalmic examination, including refraction, can often identify the pathology or abnormality that is causing the increased secretion of tears. The correction of refractive errors is useful in the management of tearing associated with asthenopia. Eversion of the upper lid is essential to rule-out any pathology (eg, giant follicles or papillae) that can be an ongoing irritant (Figure 2). Lubricants are often useful in treating exposure, which can be related to chronic ectropion, lid retraction due to thyroid disease, tear film abnormalities, etc. Embedded foreign bodies under the upper lid may also cause an increased secretion of tears with irritation.

Aberrant eyelashes (Figure 3) causing corneal or conjunctival irritation may be treated with epilation, hyfrecation (electrolysis), or cryotherapy. If a frank entropion is present, it may be treated by downward taping the eyelid (a short-term treatment) or, more

Figure 2: Vernal catarrh causing irritation and tearing

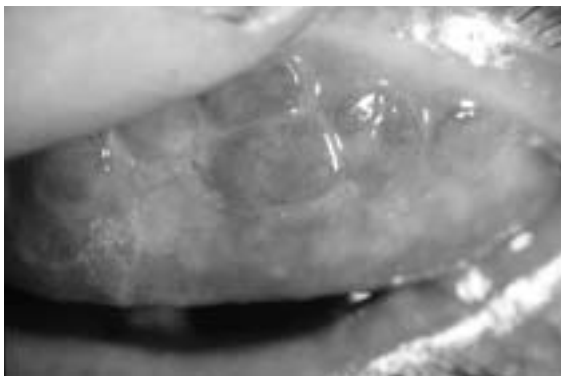


Figure 3: Distichiasis causing irritation and an increased secretion of tears



often, surgery to properly re-oppose the eyelid to the globe (Figure 4). Of note is the fact that the conjunctival scarring found in chronic inflammatory diseases (eg, ocular pemphigoid, Stevens-Johnson syndrome, or chronic keratoconjunctivitis) – all of which can alter the tear film and cause an increased secretion of tears – may also scar the punctum and/or canaliculus, making the patient even more symptomatic.

Decreased elimination of tears

If there is no abnormality causing lacrimation, the clinician must determine whether there is an abnormality in the eyelid pumping mechanism, which is responsible for moving the tears into the nasolacrimal drainage system. The lacrimal drainage system should be irrigated to rule-out any obstruction. However, it must be remembered that even if the system is completely patent to syringing, there may be a significant stenosis within it that requires radiological techniques for identification.

Eyelid abnormalities

The normal pumping action of the orbicularis oculi muscle is important for moving tears from the lateral canthus to the medial canthus and then to the puncta and lacrimal drainage pathways. On closing the eyelids, the upper and lower puncta strike the adjacent eyelids

Figure 4: Entropion causing lash irritation of the cornea and increased secretion of tears



Figure 5: When tearing is associated with other symptoms, one should think of an over-secretion of tears

Tearing plus

- itchiness - allergy
- grittiness - tearfilm ("dry")
- discharge (rule-out conjunctival disease)
- lid retraction - thyroid

and, on opening the lids, there is the suctioning of tears into the canaliculi. If there is an abnormality in punctal position against the opposing eyelid, tears will not flow into either punctum and the patient may experience epiphora (Figure 6). The lower punctum may be everted due to laxity of the medial canthal tissues, or secondary to a cicatrizing process in the skin (such as sun damage, tumours, inflammatory reaction to irritants such as cosmetics, or following cosmetic lower eyelid surgery).

If this process involves the whole eyelid, a frank ectropion may develop that inhibits the passage of tears through the punctum more profoundly (Figure 7). With a longstanding frank ectropion, the conjunctiva tends to be keratinized, which may exacerbate the deficiency of tear flow into the punctum, as well as cause problems with the surfacing of tears (Figure 8). In situations where the eyelid is well opposed to the globe and the punctum is not everted (normally the clinician should not be able to see the back wall of a normally placed punctum), the patient may still have tearing due to a "lacrimal pump dysfunction," in which tears are not pumped via proper orbicularis action into the lacrimal system.³

The clinician should test the orbicularis to see if there is indeed a lacrimal pump dysfunction. The patient should look up as the lower eyelids are manually distracted inferiorly. When the eyelid is released, it should normally "snap back" against the globe. A decreased "snap back" may indicate a lacrimal pump dysfunction. The eyelids can then be manually distracted laterally to test the tautness of the medial canthal tendon and then distracted medially to test the lateral canthal tendon. The eyelids can then be grasped

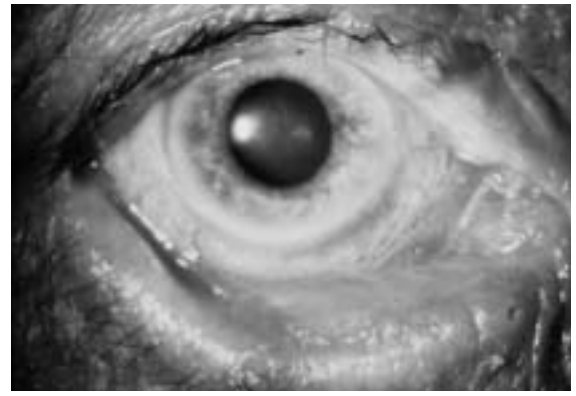
Figure 6: Punctal eversion with secondary stenosis



Figure 7: Total lid ectropion due to a skin problem



Figure 8: Chronic ectropion with keratinization of the conjunctiva



and pulled away from the globe (distraction test). Increased "distract ability" indicates a lax lid with potential pumping problems.⁴

The eyelids should be examined for cicatricial problems. It is important to have the patient look upwards and then open the mouth to see if the eyelids pull away from the globe. If this occurs, there is a cicatricial component in the eyelids that may be causing a tearing problem and this can be addressed therapeutically. The upper lid may also be involved and the clinician should test for a floppy eyelid by lifting the upper lid upwards

Figure 9: Floppy upper eyelid

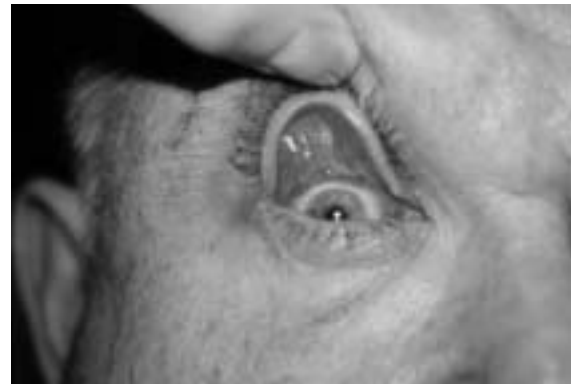


Figure 10a and 10b: Facial nerve palsy with aberrant regeneration



to see if the tarsus inverts (Figure 9). An occult facial palsy may indicate a neurogenic orbicularis problem. Aberrant regeneration of the facial nerve is the telltale sign that indicates this abnormality (Figure 10a and 10b).

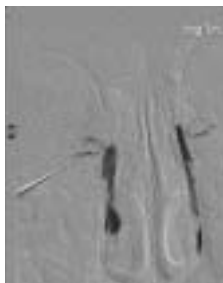
On examination of the conjunctiva, one may find hypertrophy of the conjunctiva and/or plica and/or caruncle that either displaces the punctum from the lacrimal lake, or prevents tears from entering the punctum. An attempt may be made to shrink the hypertrophic tissues with a topical decongestant or with bipolar cautery, or excise the hypertrophic tissue

The patent non-obstructed lacrimal system – can it be abnormal?

In spite of patency to syringing, there may be a nasal abnormality causing a partial obstruction to tears flowing from the nasolacrimal duct into the nose. Inflammation in the nose may cause a partial obstruction of the tear duct or increased secretion of tears via a reflex arc back to the lacrimal gland. Therefore, the nasal examination is a very important component of a lacrimal investigation. If the tear duct is completely patent to syringing, there may be an occult stenosis within the system

Figure 11: Dacryocystogram in a completely patent system showing a stenosis with prestenotic dilatation

Partially patent to syringing – right side



Marked dilatation tear sac

Figure 12: Nuclear lacrimal scan showing normal flow on the right side with mildly decreased flow on the left



inhibiting tear flow. In this situation, it is necessary to perform a more sophisticated radiological investigation, such as a dacryocystogram.⁵ This test may reveal an anatomical abnormality (stenosis) within the system. A nuclear lacrimal scan⁶ may also be useful for a physiological interpretation of the anatomical testing (syringing and/or dacryocystography). When there is complete patency to syringing, a dacryocystogram may indicate a stenosis and/or a pre-stenotic dilatation ((Figure 11). A nuclear lacrimal scan, with or without quantitation (computer determination of T 1/2 flow values), may demonstrate a decrease in tear flow from the palpebral aperture into the nose (Figure 12).

Management of patients with tearing due to decreased drainage

Ectropion

Ectropion of the punctum should be treated initially with upward lid massaging and instruction to always wipe the eyes in an UPWARD direction in an attempt to reposition the punctum against the globe. Many patients improve with this conservative management alone. If this does not help, the punctum may be inverted with retro-punctal

Figure 13: Holth punch utilized for posterior wall punctectomy (snip)



Figure 14: Diagram of skin flap from upper lid to lower lid to treat cicatricial lower lid ectropion



cautery or a conjunctival wedge excised from the inside of the eyelid, inferior to the punctum, with the lid sutured to invert the punctum.

If the whole lid is ectropic, conservative management should also be undertaken, but with lubrication of the cornea as well. If this is not successful, the eyelid can be repositioned surgically, either by a modified Bick procedure⁷ or by a tarsal strip.⁸ If the punctum has been secondarily stenotic because of eversion, especially if there is keratinization, a simple dilatation may be sufficient. If it is primarily stenotic, a “snip” procedure can be performed using either scissors or a punch (Figure 13).

If the ectropion is related to a facial palsy, it can be treated surgically. So far, however, the total relief of tearing (when related to a facial nerve problem and regardless of which eyelid procedure has been performed) is not impressive. Even reanimation and neural grafting procedures have not (in our experience) been completely effective in removing tears. If crocodile tearing is present with a facial nerve palsy, it may be treated with either botulinum toxin injections into the sphenopalatine ganglion or by performing a Vidian neurectomy. If a cicatricial component is causing the lids to evert or distract from the globe, conservative massaging and wiping is extremely useful. Failing this, skin grafting from the retroauricular region or a flap from the upper to the lower lid can help reposition the eyelids (Figure 14). In some cases, there may be ectropion with a medial canthal laxity, plus or minus a cicatricial component. In these more complex situations, ectropion surgery combined with tendon tightening and skin flaps or grafts may all be part of the procedure.

Figure 15: Placement of hemostats outlining portion of eyelid to be excised in modified Bick procedure



Eyelid pump dysfunction

When there is no ectropion of either the punctum or the eyelid (the lid is in a good position against the globe) and there is an abnormal distraction and/or resiliency test, lacrimal pump dysfunction may be the cause of tearing. Conservative upward wiping and massaging improves many patients; however, if these techniques do not improve the situation, tightening the eyelid skeleton (tarsus and ligaments) and shortening the orbicularis muscle can often help the pumping of the tears into the lacrimal drainage pathways.

Our preferred technique is a modified Bick procedure,⁷ in which a full thickness triangle is excised laterally and the lid is tightened against the globe (Figure 15). This is the same procedure that can be performed on an upper lid to treat the floppy eyelid syndrome.⁹ If the medial canthal tendon is lax, a medial canthoplasty or medial canthal tendon tightening procedure can be done (Figures 16a-16c).¹⁰

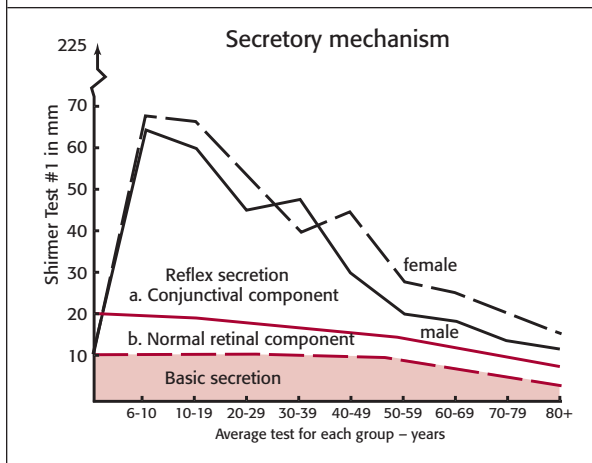
Important considerations in ectropion surgery:

- Because tear secretion decreases with age, an older person with ectropion may not have epiphora (Figure 17).
- Before operating on a patient with ectropion, the lacrimal system should be irrigated to rule-out a co-existing lacrimal obstruction that may have a role in the pathogenesis of the ectropion.

Figure 16: Medial canthoplasty. A) Skin incision, B) Tightening of medial canthal tendon, C) Final result.



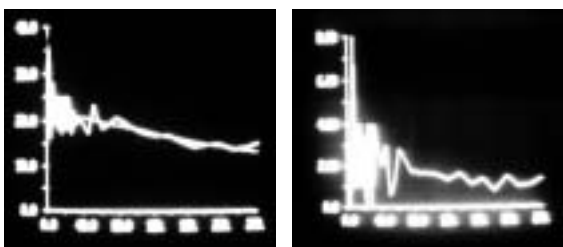
Figure 17: Diagram showing decreased secretion of tears with age



Tearing with lacrimal patency ("functional obstruction")

Dacryocystography is useful in determining whether there is an abnormality within the lacrimal drainage pathways. In a younger patient, a stenosis within the system may be significant enough to cause tearing due to the high level of tear secretion in younger people. The corollary is that an older patient may have a completely obstructed tear duct but, because of decreased tear secretion with age, there will be no epiphora. If a stenosis is demonstrable with a dacryocystogram, it can be physiologically corroborated with a nuclear lacrimal scan (Figure 18a and 18b). The treatment then is standard lacrimal drainage surgery, depending on the site of stenosis.¹¹ If both a lacrimal stenosis and an ectropion are present, these can be treated surgically in the same setting.

Figure 18a and b: Quantitative lacrimal scintillography before and after modified Bick procedure to treat a patient with tearing due to a lacrimal pump dysfunction.
A) T_{1/2} (outflow) curve from palpebral aperture
B) Increased flow (decreased remaining tracer) from palpebral aperture after surgery



Conclusion

Most patients with symptoms of tearing do NOT have lacrimal obstruction. Patients with tearing on the basis of oversecretion of tears usually have other symptoms such as grittiness, itchiness, etc. The cause of oversecretion can usually be identified on clinical examination and managed appropriately. Even if the lacrimal system is completely patent, a decreased elimination of tears may be present because of eyelid abnormalities (eg, ectropion and/or lid laxity) or a stenosis within a patent lacrimal system. The diagnosis in this situation can usually be made clinically, but occasionally, more sophisticated radiological tests are helpful. Patients with non-obstructive epiphora can usually be helped with either conservative or surgical modalities.

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