# The watery eye: it's worse than you think

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A watery eye, which is due to a mismatch between the volume of tears produced and the volume of tears removed via the lacrimal drainage system, can have a substantial adverse impact on an individual's quality of life.

MedicineToday 2011; 12(1): 59-63

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The impact of a watery eye on an individual's wellbeing is commonly underestimated. However, patients with this problem rate it highly in terms of adverse impact on their quality of life. A 'wet eye' and tear overflow may cause embarrassment, as well as blurring of vision that results in difficulty reading, an increased risk of falls and loss of driving confidence. Repeated wiping of the lids may result in lid laxity, ectropion and a dermatitic excoriation of the skin.

The cause of watery eyes can generally be determined by the family physician. With recent advances in diagnostic and surgical techniques, the definitive management of the watery eye is most commonly dealt with by ocular plastic surgeons, who comprise a subspecialty within ophthalmology.

The physiology of tearing is discussed in the box on this page. The assessment and management of a patient with a watery eye is summarised in the flowchart on page 61.

## PATIENT ASSESSMENT

### History

When questioning the patient with a watery eye, it is necessary to determine whether the problem is due to excess tear production (which is unusual) or inadequate drainage of tears away from the eye (which is common).

### PHYSIOLOGY OF TEARING

Tears are produced principally by the lacrimal gland, which is situated anteriorly in the superotemporal quadrant of the orbit. Tears wash over the eye and are important in maintaining a healthy ocular surface.

On blinking, tears are actively pumped through the upper and lower lacrimal puncta of the eyelids into the lacrimal sac (the lacrimal pump). The tears drain down the nasolacrimal duct, which opens within the inferior meatus under the inferior turbinate in the nose, and then flow posteriorly into the nasopharynx (Figures 1a and b).

A tearing or watering eye is largely evidence of a mismatch between the volume of tears produced and the volume of tears removed via the lacrimal drainage system.




Figures 1a and b. The active lacrimal pump. a (left). Lid contraction in the closure phase of blinking actively pumps tears into the lacrimal sac ('the lacrimal pump'). b (right). The tears then drain down the nasolacrimal duct into the nasopharynx during the lid opening phase of blinking.

Illustrations adapted from: Zide BM, Jelks GW. *Surgical Anatomy of the Orbit.* Raven Press: New York; 1985. p. 37.

Figure 2. A positive fluorescein dye disappearance test with a raised marginal tear film (high tear meniscus).

Figure 3. Nasal endoscopy demonstrating the presence of fluorescein (positive Jones I test).

Figure 4. Simple lacrimal irrigation to flush tears through the lacrimal drainage system.

It is important to ask the patient about ocular irritative symptoms that precede tearing. Ocular surface irritation causes a reflex (and indeed protective) overproduction of tears, which results in tearing even in the presence of a normal lacrimal drainage system. Conditions that irritate the ocular surface include:

- ectropion – the lower lid rolls out and exposes the inside surface of the lid to air. The exposed lid becomes dessicated, with resulting inflammation of the exposed conjunctiva of the lid. There is secondary malposition of the lacrimal punctum of the lower lid, which further increases the tearing.
- entropion – the lower lid intermittently rolls over on itself, causing the eyelashes to touch the cornea. The irritative symptoms are often relapsing, with intervening symptom-free periods.
- trichiasis – aberrantly-growing lashes are directed towards the cornea, while the lid maintains its normal position. The ocular irritation is thus more constant than irritation due to entropion.
- blepharitis – chronic inflammation of the eyelid. Associated skin disorders of either rosacea or seborrhoeic dermatitis are often present.
- any ocular foreign body.

Tears contain numerous enzymes, including lysozyme, and overflow onto the skin can cause an excoriating dermatitic reaction. Patients often confuse ocular surface irritative symptoms with symptoms related to excoriation of the periorbital skin. For adequate management, it is important to take this into consideration when first questioning the patient.

A brief sinus history is useful because pathology of the maxillary and ethmoid sinuses can affect tear flow within the nasolacrimal duct.

## Examination

The aim of the clinical examination is to differentiate between overproduction of tears and defective drainage of tears. The fluorescein tests described below are useful (with care taken to avoid spilling fluorescein onto the patient's clothes). Tearing due to poor drainage can be related to:

- upper system obstruction (from lacrimal punctum to common canaliculus)
- lacrimal pump dysfunction (e.g. poor blinking, such as with involutional changes, facial palsy and Parkinson's disease)
- lower system obstruction (from lacrimal sac to nasolacrimal duct/ nose).

Simple digital pressure over the lacrimal sac may enable the clinician to feel the normal concavity of the lacrimal sac region. Sometimes, a mucocele can be palpated; the application of pressure over the mucocele may occasionally allow large quantities of mucopus to reflux into the eye.

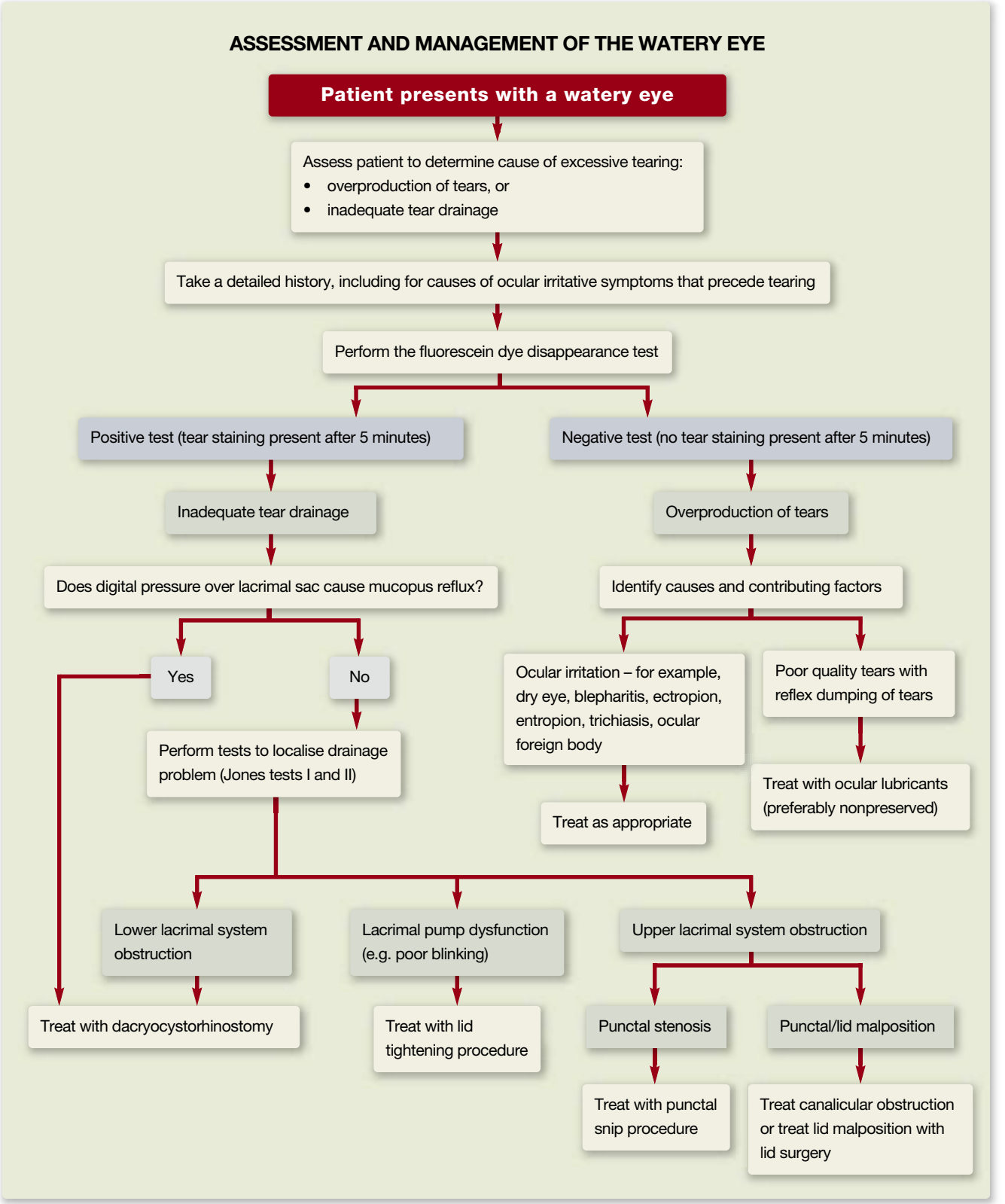
### Fluorescein dye disappearance test

To perform the fluorescein dye disappearance test, the tear film is stained with one drop of 2% fluorescein bilaterally. After five minutes, the patient is examined to see whether the tears are still fluorescein-stained. The absence of fluorescein (negative test) in the tearing patient suggests increased tear production but reasonable tear drainage. The presence of fluorescein and a high tear meniscus (positive test) indicates defective tear drainage (Figure 2).

### Jones I and II tests

When inadequate tear drainage is detected, it is necessary to determine whether this is due to an upper system and/or pump problem or to a drainage problem. The Jones fluorescein tests are useful, allowing the clinician to determine whether tears reach the distal end of the nasolacrimal duct within the inferior meatus of the nose. Jones described the test using a cotton-tip, which is placed under the inferior turbinate before 2% fluorescein (1 to 2 drops) is instilled in the tears, and inspected after five minutes for fluorescein staining. Nasal endoscopy has rendered the test more

## ASSESSMENT AND MANAGEMENT OF THE WATERY EYE



## DACRYOCYSTORHINOSTOMY

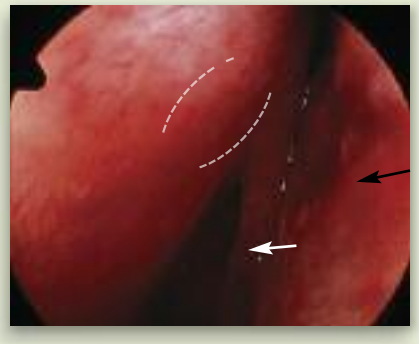
Dacryocystorhinostomy (DCR) is a procedure to treat a narrowed or blocked nasolacrimal duct in which a fistula is created between the lacrimal sac and the lateral wall of the nose (Figure 5).[1,2] This allows tears to pass directly from the lacrimal sac (Figure 6) into the nasal cavity, bypassing the blocked nasolacrimal duct. Figure 7 demonstrates intraoperative surgical opening of the lacrimal sac in the case of obstructed lacrimal drainage with immediate release of mucopurulent material into the nose prior to definitive creation of the mucosa-lined fistula.

Towards the conclusion of the procedure, fine silicone stents are placed via the canaliculi into the nose (Figures 8 and 9). These are temporarily secured with a dissolvable cellulose pack railroaded around the silicone stents to keep the flaps of the opened lacrimal sac in place. The silicone stents are removed in the doctor's rooms three weeks postoperatively, and the patient is subsequently reviewed at 10 to 12 weeks to ensure that the ostium is patent (Figure 10).

Historically, DCR has mostly been performed via an external skin incision on the side of the nose. However, since the advent of powered instrumentation and the development of new endonasal techniques, the procedure is now often performed endoscopically via a transnasal approach under direct vision. The external and endoscopic procedures both take approximately 40 minutes to complete, and are performed as day-surgery with equal success rates (>92%).[3,4] External DCR is usually performed under a local anaesthetic with sedation. Endoscopic DCR is typically performed under general anaesthesia because the noise and irrigation from the mechanised drill can be bothersome to the patient.

Endoscopic DCR has several advantages. A transnasal approach allows the surgeon to deal with conditions that may occlude the intranasal portion of the ostium formed during the DCR procedure – for example, an enlarged pneumatised middle turbinate (concha bullosa), significant septal deviation or inflammatory polyps. In addition, a skin incision and scar on the face are avoided in endoscopic DCR.[5]

External DCR can potentially compromise the lacrimal pump mechanism because the inferomedial fibres of the orbicularis are disturbed in order to access the lateral wall of the nose via a skin incision.



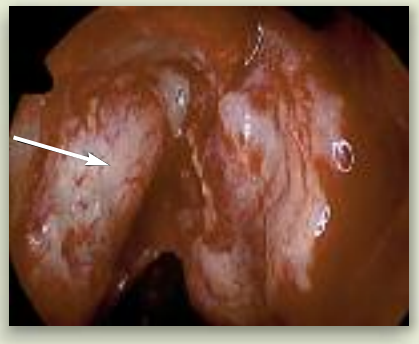


Figure 5 (top left). Typical view of the lateral wall of the nose showing the position of the lacrimal sac (oval), nasal septum (black arrow) and middle turbinate (white arrow).

Figure 6 (top right). Exposed lacrimal sac (arrow) following bone removal.

Figure 7 (left). Incision into the lacrimal sac with release of pus.

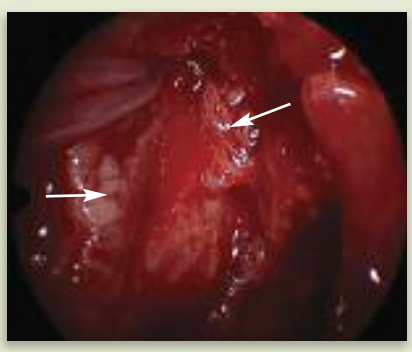


Figure 8. Newly fashioned lacrimal sac flaps (arrows).

Figure 9. Stents placed to hold the flaps in place until they heal.

Figure 10. A mature fistula (arrow) successfully bypassing the obstructed nasolacrimal duct.

accurate, more comfortable and simpler to perform (modified Jones test). A combined lignocaine/phenylephrine spray is applied to both nostrils to anaesthetise and decongest the nose, before fluorescein is instilled into the tears. Using a 30-degree rigid endoscope, the distal end of the nasolacrimal duct is then inspected (Figure 3).

Detection of fluorescein in the nose indicates that the nasolacrimal duct is patent (positive Jones I test). If no fluorescein reaches the nose (negative Jones I test) then saline is used to irrigate the system and flush through any tears that have entered the lacrimal system but become held up at a stricture in the nasolacrimal duct (Jones II test). The irrigation is carried out using a 25-gauge lacrimal cannula attached to a 3 mL saline-filled syringe. The cannula is placed into the lower canaliculus and saline irrigated through the lacrimal system (Figure 4). The inferior meatus is again inspected endoscopically for fluorescein-stained tears.

If the nasolacrimal duct is completely obstructed, the Jones I test will be negative. On syringing, saline will hit the obstruction and reflux back out the punctum of the ipsilateral upper lid, and no fluorescein will be irrigated into the inferior meatus (negative Jones II test). If there is partial obstruction or narrowing of the nasolacrimal duct, syringing saline will flush fluorescein-stained tears into the inferior meatus (positive Jones II test).

If there is an upper system obstruction (punctum or canaliculus) or lacrimal pump dysfunction, then no fluorescein-stained tears will enter the lacrimal drainage system to be flushed through with saline (negative Jones I and II tests).

The Jones test results in the patient with a watery eye are summarised below.

- Negative Jones I and II tests together with normal flow through the canaliculus into the nose from the saline lacrimal sac washout indicates that the drainage hold-up is in the upper lacrimal system, before the lacrimal sac. Treatment is aimed at repairing the lacrimal pump or lid position.
- Negative Jones I and II tests together with no flow into the nose from the saline lacrimal sac washout indicates complete obstruction of the lower system (lacrimal sac or nasolacrimal duct). It is treated by dacryocystorhinostomy (DCR).
- A negative Jones I test and positive Jones II test indicates that there is a significant narrowing in the lower lacrimal system. It is treated by DCR.
- A positive Jones I test indicates that the nasolacrimal duct is patent.

## TREATMENT

### For overproduction of tears

It is important to treat the cause of the tear overproduction. Lid malposition such as entropion or ectropion is best treated surgically. Trichiasis is treated with various therapies, ranging from regular epilation to laser or electrocautery to destroy the lash follicles. Poor quality or low volume tears resulting in reflex overproduction of tears is best treated with regular ocular lubricants.

### For tear drainage problems

If the lacrimal puncta within the lids are stenosed, these are dilated and then the punctal opening is enlarged using small fine-tipped scissors ('punctal snip'). Laxity or malposition of the lower lid causing ectropion, so that the punctum does not sit within the lacrimal lake in order to accept tears, requires a lid procedure specific to the underlying eyelid pathology. The most common cause of lacrimal pump dysfunction in the presence of a normal punctal position is lid laxity, which can be repaired with a horizontal lid tightening procedure to reinstate normal lid tension.

The most common mechanical cause of tearing is nasolacrimal duct narrowing. Fortunately, treatment for this, DCR, has progressed significantly over the past few years (see the box on page 62), improving patients' quality of life.[6]

## KEY POINTS

- Watery eyes are not a trivial problem for the patient.
- The cause of watery eyes can generally be determined by the family physician.
- It is important to treat a cause of tear overproduction.
- Definitive surgery is available for lower lacrimal system obstruction and lid malposition and is highly effective, improving quality of life. MT

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COMPETING INTERESTS: None.