



**CAUSES,  
COMPLICATIONS  
& TREATMENT** of  
a **“RED EYE”**

Most cases of “red eye” seen in general practice are likely to be conjunctivitis or a superficial corneal injury, however, red eye can also indicate a serious eye condition such as acute angle glaucoma, iritis, keratitis or scleritis. Features such as significant pain, photophobia, reduced visual acuity and a unilateral presentation are “red flags” that a sight-threatening condition may be present. In the absence of specialised eye examination equipment, such as a slit lamp, General Practitioners must rely on identifying these key features to know which patients require referral to an Ophthalmologist for further assessment.

## Is it conjunctivitis or is it something more serious?

The most likely cause of a red eye in patients who present to general practice is conjunctivitis. However, red eye can also be a feature of a more serious eye condition, in which a delay in treatment due to a missed diagnosis can result in permanent visual loss. In addition, the inappropriate use of antibacterial topical eye preparations contributes to antimicrobial resistance.

Most general practice clinics will not have access to specialised equipment for eye examination, e.g. a slit lamp and tonometer for measuring intraocular pressure, and some conditions can only be diagnosed using these tools. Therefore primary care management relies on noting key features such as pain, photophobia and reduced visual acuity, to identify which patients require referral for ophthalmological assessment. In general, a patient with a unilateral presentation of a red eye suggests a more serious cause than a bilateral presentation.

**There are six serious causes of red eye, which can result in visual loss:<sup>1</sup>**

1. **Acute angle closure glaucoma** occurs when there is an obstruction to drainage of aqueous humour from the eye, rapidly causing increased intraocular pressure. This condition typically occurs in middle-aged to elderly, hypermetropic (long-sighted) females,<sup>2</sup> however, it can occur in any patient.
2. **Keratitis** is inflammation of the corneal epithelium caused by infection (e.g. herpes simplex virus, bacteria, fungi or protozoa) or auto-immune processes (e.g. collagen vascular diseases).<sup>3</sup> Microbial keratitis is usually precipitated by a change to normal corneal epithelial health, caused by a factor such as trauma, contact lens use or tear film and/or eyelid pathology.
3. **Iritis** is inflammation of the iris that can be associated with other inflammatory disorders, e.g. ankylosing spondylitis, or occur as an isolated idiopathic condition.

Iritis is also known as anterior uveitis; posterior uveitis is inflammation of the choroid (choroiditis). Complications include glaucoma, cataract and macular oedema.

4. **Scleritis** is inflammation of the sclera. This is a very rare presentation, usually associated with autoimmune disease, e.g. rheumatoid arthritis.
5. **Penetrating eye injury or embedded foreign body;** red eye is not always a feature
6. **Acid or alkali burn to the eye**

The patient history will usually identify a penetrating eye injury or chemical burn to the eye, but further assessment may be necessary in order to determine whether a patient presenting with red eye has any “red flag” features which suggests one of these sight-threatening conditions.

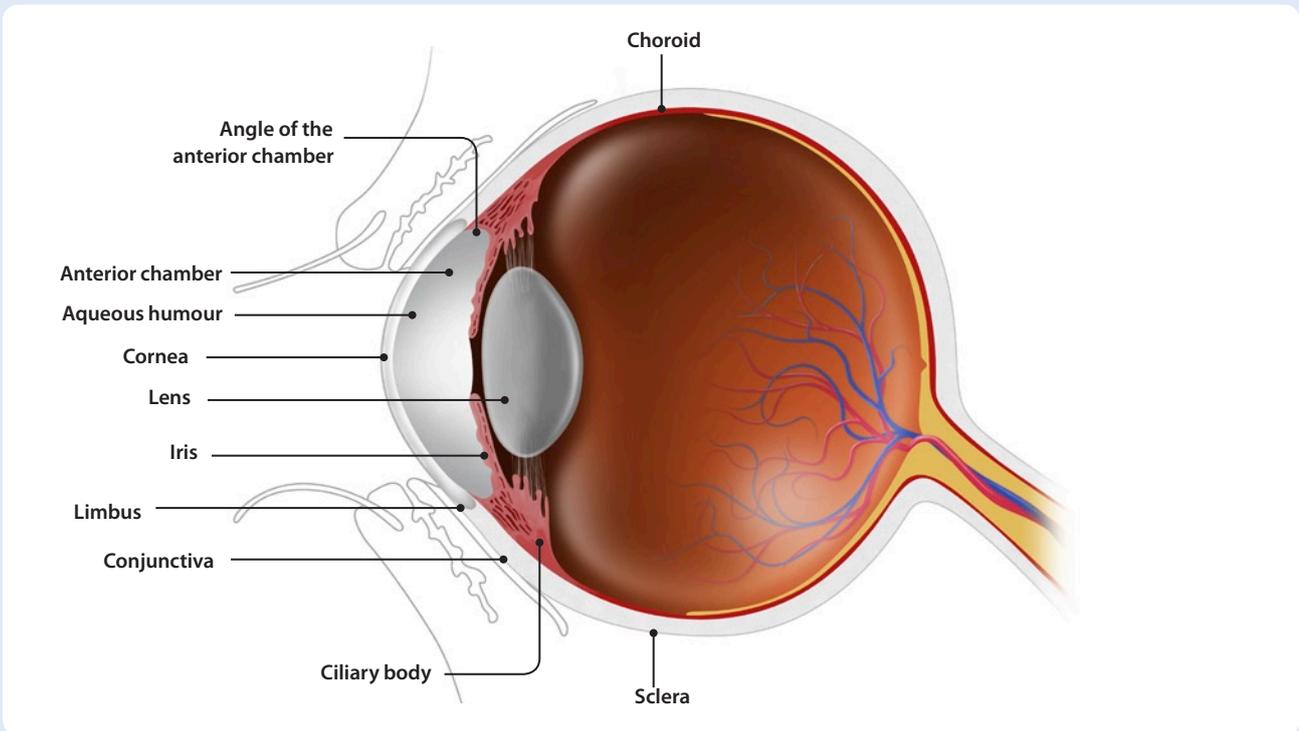
## History and eye examination

The most important findings in a patient with a red eye are the presence of pain, photophobia or reduced visual acuity (Table 1, Page 13).

Ask about:

- Duration, nature and onset of symptoms
  - Dull, stabbing, throbbing or gritty pain?
  - One eye, both or sequential?
- Exposure to chemicals or other irritants, foreign body or trauma
- Photophobia
- Changes to vision; reduction in acuity, haloes, other visual disturbances
- Discharge from the eye; nature, volume and persistence
- Past ocular history
  - Previous episodes?
  - Previous herpetic eye disease?
  - Previous eye surgery?
  - Contact lens use – hygiene practices?

## Anatomy of the eye



**Anterior chamber** The fluid filled space between the iris and the inner surface of the cornea

**Angle of the anterior chamber** The width of angle of the anterior chamber (iridocorneal angle) affects the drainage rate of aqueous humour from the anterior chamber into the trabecular meshwork; a narrow or closed angle reduces drainage

**Aqueous humour** A transparent fluid that fills the anterior chamber of the eye. Production is constant, therefore drainage is the key determinant of intraocular pressure.

**Choroid** A vascular layer between the sclera and retina that provides oxygen and nutrition to the retina

**Ciliary body** The circumferential tissue, anterior to the retina, composed of ciliary muscle and ciliary processes that change the shape of the lens to adjust focus – a process called accommodation. The ciliary processes also produce aqueous humour.

**Conjunctiva** A thin, clear yet vascular layer of epithelial and subepithelial tissue that covers the sclera and inside of the eyelids. Inflammation (conjunctivitis) causes vascular dilatation and can produce significant oedema of this tissue (chemosis).

**Cornea** The transparent, convex layer of the eye in front of the iris, pupil and anterior chamber; the cornea provides a mechanical barrier but its curvature provides most of the focusing power of the eye.

**Iris** A thin, opaque (coloured), circular structure that controls the size of the pupil and the amount of light that reaches the retina

**Lens** A biconvex structure behind the iris that helps to refract light to accurately focus on the retina

**Limbus** The border between the sclera and the cornea

**Sclera** The opaque protective outer layer of the eye (the “white of the eye”) that covers everything except the cornea

- Occupational history, e.g. outdoor worker, metal fabricator, childcare worker
- The presence of any other symptoms, e.g. recent or concurrent upper respiratory tract infection, skin and mucosal lesions, muscular or skeletal pain, joint stiffness, genitourinary discharge, dysuria; these symptoms may indicate an underlying systemic cause of the red eye

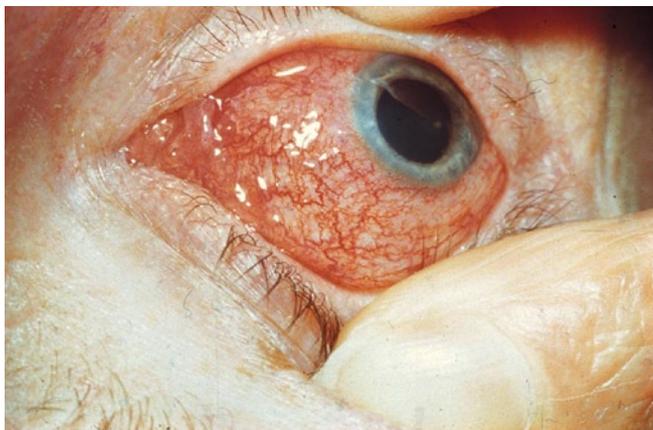
### Examination and assessment

The extent of the eye examination should be based on the patient's history and suspected cause of the red eye. Examination should be very brief in the case of a chemical injury to the eye as irrigation of the eye is the priority and should begin immediately. A topical anaesthetic, e.g. tetracaine, may be used if the examination is uncomfortable for the patient.<sup>1</sup>

**Measure visual acuity** of both eyes using a Snellen chart. Ensure good lighting, and use a pinhole to exclude any residual refractive error. The patient should wear their corrective distance glasses, if they have them. If the patient has discharge in their eye(s), ask them to blink several times before checking vision, to ensure that an accurate assessment is made.

#### Examine the eye:

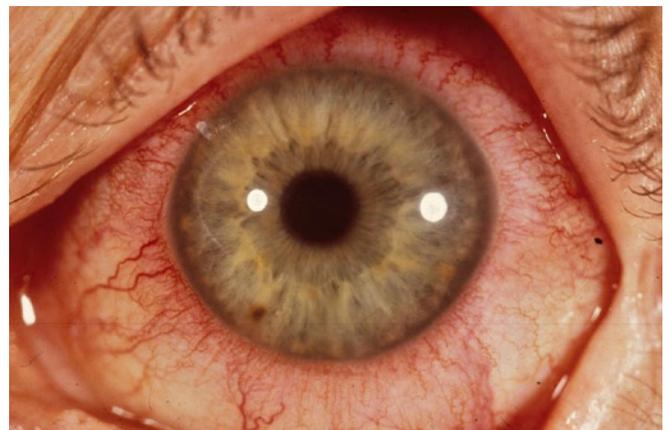
- Assess the extent, location and nature of the redness of the eye(s)
  - The pattern of injection (redness) should also be noted: **conjunctival injection** (Figure 1) appears as a diffuse area of dilated blood vessels, injection in a ring-like pattern around the cornea is termed **ciliary injection** (Figure 2) and usually indicates intraocular inflammation



**Figure 1:** Conjunctival injection – showing a diffuse pattern of dilated blood vessels. Photo kindly supplied by Dr Logan Mitchell, Department of Medicine, University of Otago.

- Is there any discharge? Is it purulent or clear?
- Is there any evidence of hyphema (blood in the anterior chamber) or hypopyon (purulent exudate in the anterior chamber)?
- Is there swelling of the eyelids, around the eye or of the conjunctiva?
- Examine the pupils
  - Are they equal? Any irregularity of shape?
  - Measure pupillary response/light reflexes
- Examine the cornea; is it clear or opaque/hazy? Is there localised corneal opacity representing a corneal infiltrate?
  - Instill and assess the results of fluorescein dye (see below)
- Look for a foreign body or lesion on the eye, including under the eyelids; eyelid eversion may be required, but do not attempt this if the mechanism of injury and/or clinical signs suggest the possibility of a penetrating eye injury
- Examine the eyelids
  - Is lid position normal? Is lid closure complete? Any evidence of blepharitis? Are the eyelashes intumed (trichiasis)?

**Assessing the cornea with fluorescein dye:** Fluorescein is an orange dye that fluoresces green under blue light. It dissolves into the tear film creating a homogenous green glow across the ocular surface, with increased intensity where the tears accumulate on the lower lid margin. Any area of epithelial defect will stain brightly, allowing detection of corneal abrasions, ulcers and foreign bodies.



**Figure 2:** Ciliary injection – showing a ring-like pattern of dilated blood vessels around the cornea, which indicates inflammation of the cornea, iris or ciliary body. Photo kindly supplied by Dr Logan Mitchell, Department of Medicine, University of Otago.

Patients should be asked to remove contact lenses before fluorescein dye is applied. Instil the dye by either touching a fluorescein strip to the inside of the lower eyelid, or applying a drop of fluorescein dye eye drops; ask the patient to blink to distribute the dye. Examine the eye using a blue light (usually a direct ophthalmoscope with the cobalt blue filter) looking for areas of increased staining intensity. Note the distribution, size and pattern/shape.

## Refer serious causes of red eye

### “Stop!” Red flags

Patients with the following features should be referred urgently (same day) for ophthalmological assessment:<sup>1,4</sup>

- Severe eye pain
- Severe photophobia
- Marked redness of one eye
- Reduced visual acuity (after correcting for refractive errors)
- Suspected penetrating eye injury
- Worsening redness and pain occurring within one to two weeks of an intraocular procedure (possible post-operative endophthalmitis, see Page 15)
- Irritant conjunctivitis caused by an acid or alkali burn or other highly irritating substance, e.g. cement powder; irrigate eye until pH neutral prior to referral (see below)
- Purulent conjunctivitis in a newborn infant (refer to a Paediatrician)

At this point in the consultation, the cause of the red eye may be obvious, e.g. foreign body, or the features may be severe enough to warrant urgent referral. Table 1 summarises distinguishing features to determine the cause of a red eye. Many patients with red eye may have ambiguous features and require a slit-lamp examination to be certain of a diagnosis. If there is any suspicion of a serious cause then discussion with an Ophthalmologist is recommended. A triage assessment by an Optometrist may also be useful, especially in remote locations.

**Refer urgently for an ophthalmological assessment** if the patient is suspected to have acute angle closure glaucoma, iritis, scleritis, infectious/inflammatory keratitis or a penetrating eye injury.

**Patients with a serious chemical eye injury also require urgent referral** but the first priority is irrigation of the ocular surface: topical anaesthetic should be applied, the eyelids held

open and  $\geq 500$  mL of normal saline or sterile water flushed across the globe, ideally using an intravenous giving set. Check the pH of the tear film using litmus paper two to three minutes after each bag of fluid and repeat until the pH measures 7 – 8 and appears equal between the two eyes.

**Patients with an injury which has penetrated the eye should be referred immediately for an ophthalmological assessment.**

Tetanus status should be determined, a hard shield taped over the eye (without exerting pressure on the globe), and the patient instructed not to eat or drink in preparation for possible surgery. A penetrating injury may be obvious in the case of a grossly misshapen globe or a full-thickness corneal or scleral laceration with prolapse of intraocular contents. However, subtle clues to look for include a shallowing of the anterior chamber in that eye, or tear-drop distortion of the pupil due to the iris prolapsing through an unnoticed wound, although these features may be difficult to detect without the use of a slit lamp. Patients with an injury caused by a high-velocity object, e.g. when striking metal on metal, or a sharp object, e.g. glass, thorn, knife, should be treated as having a high suspicion of penetrating injury, even if no foreign object is visible.<sup>5</sup>

### Management of acute angle closure glaucoma

This is a medical emergency and the patient should be discussed with an Ophthalmologist immediately to determine initial management and arrange urgent assessment.

Symptoms of raised intraocular pressure are deep eye pain (described as throbbing, drilling pain), redness, blurred vision (often with haloes around lights due to corneal oedema), headache, nausea and vomiting. Suggestive signs are ciliary injection, fixed mid-dilated pupil, a generally hazy cornea and decreased visual acuity (Figure 3).



**Figure 3:** Acute glaucoma – showing hazy cornea, indistinct iris and fixed, mid-dilated pupil. Photo kindly supplied by Dr Logan Mitchell, Department of Medicine, University of Otago.

**Table 1:** Features of conditions causing red eye<sup>1, 8, 9</sup>

Cause of red eye						
Feature	Conjunctivitis	Subconjunctival haemorrhage	Keratitis	Iritis (anterior uveitis)	Acute angle closure glaucoma	Scleritis
<b>Conjunctival injection</b>	Diffuse, unilateral or bilateral	Unilateral, not truly injected but rather discrete confluent haemorrhagic change (generalised in severe cases)	Ciliary pattern,* unilateral	Ciliary pattern, unilateral	Ciliary pattern, unilateral	Localised, unilateral
<b>Cornea</b>	Clear	Clear	Hazy, localised opacity (infiltrate), epithelial defect (fluorescein positive)	May be hazy	Hazy, iris detail indistinct	Clear
<b>Pupil</b>	Unaffected	Unaffected	Unaffected (unless secondary uveitis present)	Constricted, poor light response, may be distorted	Fixed, mid-dilated	Unaffected (unless secondary uveitis present)
<b>Vision</b>	Generally unaffected	Unaffected	Moderately to severely reduced	Mildly to moderately reduced.	Severely reduced, blurred, possible coloured halos around lights	May be reduced
<b>Discharge</b>	Yes; purulent more likely with bacterial, watery more likely with viral	Minimal (watery)	Yes; usually watery	Minimal (watery)	Minimal (watery)	Minimal (watery)
<b>Ocular pain</b>	Yes; gritty or stabbing pain	Generally none	Yes; usually severe	Yes; moderate to severe	Yes; usually severe (with vomiting and headache), globe tender and hard if palpated	Moderate to severe (described as deep pain), localised significant tenderness
<b>Photophobia</b>	No	No	Yes	Yes	Sometimes	Sometimes

\* Redness in a ring-like pattern around the cornea; indicating inflammation of the cornea, iris or ciliary body

Although most General Practitioners will not have access to a tonometer (to measure the intraocular pressure), digitally palpating the globe behind closed eyelids and comparing globe firmness provides useful information. In some circumstances and locations an urgent intraocular pressure measurement by a local Optometrist may be indicated. While waiting, the patient should lie flat with their face up, without a pillow. This may decrease the intraocular pressure by allowing the lens and iris to “sink” posteriorly, opening up the drainage angle. The Ophthalmologist may recommend an immediate dose of acetazolamide 500 mg, orally or IV, before a patient travels from a remote location.

### Management of keratitis, iritis and scleritis

**Keratitis** can result from several aetiologies, including bacterial keratitis (most commonly secondary to contact lens use) or herpetic keratitis (see “Herpes simplex keratitis”). Key features

are pain, photophobia and decreased vision. In severe cases, a level of purulent exudate within the anterior chamber may be seen (a hypopyon). Refer to an Ophthalmologist for treatment, which usually involves intensive topical antimicrobials.<sup>1</sup>

**Iritis (anterior uveitis)** is often very painful due to ciliary muscle spasm. Key features also include photophobia and decreased vision, and the pupil will usually appear constricted with a poor light response and will sometimes be distorted due to adhesions. Ophthalmological assessment will confirm the diagnosis and exclude any possible infectious cause. Treatment (of non-infectious uveitis) involves topical, periocular or systemic corticosteroids, as well as cycloplegics (dilating drops) to reduce pain and prevent adhesions in the eye.

**Scleritis** (Figure 5) is characterised by severe, intense eye pain, described as deep, drilling pain, like a toothache.<sup>1</sup> It is

### Herpes simplex keratitis (dendritic ulcer)

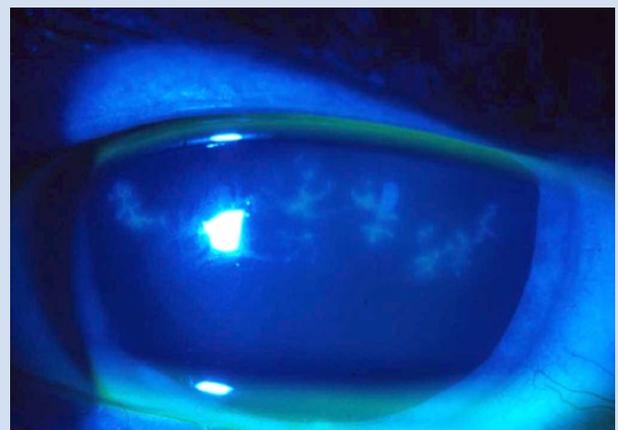
Reactivation of the herpes simplex type 1 virus (“cold sores”) can, in some people, result in ocular symptoms; the patient may not always be aware of a previous herpetic infection.

Active herpes simplex keratitis is an inflammation of the corneal epithelium due to viral replication and infection causing characteristic dendritic corneal ulcers. Ulcers can be seen with fluorescein dye and appear as fine, branching (i.e. dendritic) lesions (Figure 4).<sup>6</sup> Without the use of a slit lamp, these lesions can easily be confused with an abrasion (and vice versa).

Subsequent complications can include an inflammatory response (without active viral replication) inside the middle layer of the cornea (stromal keratitis), or inside the eye (iritis/uveitis). There is usually no corneal epithelial defect, therefore fluorescein staining is not seen in these conditions, although the cornea is usually hazy in stromal keratitis.<sup>6</sup>

Patients with suspected herpes simplex keratitis should be referred for ophthalmological assessment (or consider Optometrist triage if uncertain and the use of a slit lamp would assist in diagnosis). Ocular anti-viral treatment is

usually given (aciclovir 3% eye ointment).<sup>6</sup> Recurrences (almost always in the same eye) are common and can occur many years after the previous episode. Long-term complications can include corneal scarring and visual loss.<sup>6</sup>



**Figure 4:** Dendritic ulcers – using a cobalt light and fluorescein dye, fine branching lesions (dendritic ulcers) can be seen; these are characteristic of herpes simplex keratitis. Photo kindly supplied by Dr Logan Mitchell, Department of Medicine, University of Otago.



**Figure 5:** Scleritis – showing localised conjunctival injection.  
Photo kindly supplied by Dr Logan Mitchell, Department of Medicine, University of Otago.



**Figure 6:** Viral conjunctivitis – showing diffuse conjunctival injection, watery discharge and inflammation; typically presents sequentially in one eye, then the other eyes. Photo kindly supplied by Dr Logan Mitchell, Department of Medicine, University of Otago.

usually associated with an underlying systemic autoimmune or inflammatory condition, therefore treatment focuses on the systemic cause, after Ophthalmological assessment.

 For information on episcleritis, see Page 19.

### Endophthalmitis

Endophthalmitis is a sight- and globe-threatening internal infection of the eye. It is most commonly iatrogenic, occurring after recent intraocular surgery (usually less than one to two weeks prior), but can rarely occur from endogenous causes such as septicaemia or endocarditis. A patient may present with worsening pain, redness and/or visual loss. A level of purulent exudate within the anterior chamber (a hypopyon) may be visible. Urgent ophthalmological assessment is required, with treatment involving sampling of intraocular fluids, intravitreal antibiotics and possibly vitrectomy surgery.

## Managing red eye in primary care

### Conjunctivitis

Conjunctivitis can be viral, bacterial or allergic. Bacterial and especially viral conjunctivitis are often highly contagious. As a general rule, purulent discharge indicates bacterial conjunctivitis and a clear or mucous discharge indicates viral or allergic conjunctivitis. The presence of pruritis, a history of atopy and exposure to a known allergen usually helps to differentiate allergic conjunctivitis from viral.

**Viral conjunctivitis** is usually caused by an adenovirus. Typical features are sequential bilateral red eyes, watery discharge and inflammation around the eye and eyelids, which can produce dramatic conjunctival swelling (chemosis) and lid

oedema, to the extent that the eye is swollen shut. The patient usually reports a feeling of grittiness or stabbing pain, and may also have rhinorrhoea or other respiratory symptoms.<sup>10</sup> Crusting of the lashes overnight can sometimes be confused for a purulent discharge. Enlarged, tender preauricular lymph nodes are often present, and are a useful feature to assist diagnosis.<sup>11</sup>

As there is no effective viricidal treatment against adenovirus, viral conjunctivitis is treated supportively. Advise the patient to clean away secretions from eyelids and lashes with cotton wool soaked in water, wash their hands regularly, especially after touching eye secretions, avoid sharing pillows and towels and avoid using contact lenses. Artificial tear eye drops can be used if necessary to reduce discomfort.<sup>11, 12</sup>

Symptoms may take up to three weeks to resolve. In severe cases, punctate epithelial keratitis may develop – this can be seen with fluorescein staining as multiple small erosions of the conjunctiva. Patients with this complication may report ongoing discomfort for several weeks, which then resolves spontaneously.<sup>11</sup> Immune sub-epithelial infiltrates may develop after the conjunctivitis has settled, impairing visual acuity. These cannot be seen with fluorescein dye, and can take several weeks to resolve spontaneously.

**Bacterial conjunctivitis** is usually caused by *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus* or *Moraxella catarrhalis*. Less commonly, *Chlamydia trachomatis* or *Neisseria gonorrhoeae* may be the causative organism. Symptoms are similar to viral conjunctivitis, but discharge is usually mucopurulent and may cause the eyelids to become “glued” together after sleeping.<sup>11</sup> Symptoms are usually more

## Artificial tears and lubricants

The discomfort of dry or irritated eyes may be relieved by the use of tear replacement preparations (artificial tears) and ocular lubricants. Lubricants are generally thicker, ointment-based products, which can cause blurred vision, therefore are most appropriate for use overnight. Lubricants generally should not be used while wearing contact lenses.

Artificial tear preparations traditionally contain hypromellose, carmellose, carbomers, polyvinyl alcohol, povidone (an antiseptic) or sodium hyaluronate. Sodium chloride solution is often used by people who wear contact lenses, to relieve discomfort. Paraffin is a common ocular lubricant.

 The range of lubricating eye preparations (with a preservative) that are fully subsidised without restrictions has widened to include thick and thin artificial tear drops, a gel and an eye ointment. Some products are also available for purchase over-the-counter. Check the New Zealand Formulary or Pharmaceutical Schedule for subsidy information before prescribing.

### Preservative-free eye preparations now subsidised

Eye treatments prepared in multi-use bottles or tubes contain a preservative to prevent contamination. This preservative is often mildly toxic to the corneal epithelium, leading to a toxic keratopathy (non-inflammatory disease of the cornea) in patients sensitive to these agents, or those receiving these drops frequently and long-term. PHARMAC has approved the funding of three preservative-free lubricating eye preparations,

subject to Special Authority criteria. The Special Authority requirements are that patients must have a confirmed diagnosis, with slit lamp, of severe secretory dry eye, and either require eye drops more than four times daily on a regular basis or have a confirmed allergic reaction to preservative in eye drops. Therefore preservative-free eye preparations are likely to be initiated by an Ophthalmologist and continued in general practice.

The preparations available with Special Authority are:

- Sodium hyaluronate eye-drops 1 mg/mL (Hylo-Fresh), a preservative-free thin lubricating eye-drop; available from 1 July, 2013. N.B. In contrast to most eye preparations which have a one month expiry after opening, Hylo-Fresh has a six month expiry after opening.
- Macrogol 400 0.4% with propylene glycol 0.3% eye drops (Systane Unit Dose), a preservative-free thick lubricating eye-drop; available from 1 August, 2013
- Carbomer ophthalmic gel 0.3% (Poly-gel), a preservative-free lubricating gel; available from 1 August, 2013

Retinol palmitate 138 micrograms/g ophthalmic ointment (VitA-POS) is available from 1 July, 2013, fully subsidised (without restrictions). This is a preservative-free lubricating eye ointment for dry eyes.

 For full details visit: [www.pharmac.health.nz](http://www.pharmac.health.nz) or [www.nzf.org.nz](http://www.nzf.org.nz)



severe and persistent in patients with conjunctivitis caused by *Chlamydia trachomatis* or *Neisseria gonorrhoeae* (termed hyperacute conjunctivitis).

Bacterial conjunctivitis is self-limiting in most people and symptoms resolve without treatment within one to two weeks (although resolution may be more rapid in some people).<sup>11, 13</sup> Advise supportive treatment (as for viral conjunctivitis). Avoid the use of cosmetics applied to the eye area as these may be contaminated.

There has been much debate as to whether the use of topical antibiotics improves recovery time in people with bacterial conjunctivitis. A 2012 Cochrane review of 11 randomised controlled trials concluded that the use of antibiotic eye drops for bacterial conjunctivitis modestly improved the rate of "clinical and microbiological remission" and was associated with a low risk of serious adverse effects.<sup>13</sup> The meta-analysis found that after five days, symptoms had resolved in 30% of patients receiving placebo and in 40% of those receiving a topical broad-spectrum antibiotic. By day ten there was 41% remission in the placebo group and 50% remission in the antibiotic group.<sup>13</sup>

Most patients (or parents of young patients) who present to general practice with bacterial conjunctivitis will expect to receive topical antibiotic treatment. The limitations of treatment should be explained and, if appropriate, offer a "back pocket prescription" and instruct the patient (or parent) to delay starting treatment for a few days to see if the symptoms resolve.<sup>11</sup> Antibiotics may be started immediately if symptoms are severe or distressing. The recommended treatment for adults and children aged over two years is chloramphenicol 0.5% eye drops, one to two drops, every two hours for the first 24 hours, then every four hours, until 48 hours after symptoms have resolved. Chloramphenicol 1% eye ointment can also be used at night in patients with severe infections or as an alternative to eye drops for those who prefer this formulation. Fusidic acid 1% eye gel is an alternative to chloramphenicol, and is preferred in women who are pregnant; one drop, twice daily, until 48 hours after symptoms have resolved.

 Pharmacists who have trained in the diagnosis and management of conjunctivitis may sell chloramphenicol eye preparations, subject to conditions; appropriate verbal and written information on the self-management of eye conditions must be given to all people purchasing these medicines.

Laboratory investigations (i.e. a swab) to identify bacteria and sensitivity to antibiotics are not usually required, but may be considered in immunocompromised patients or if symptoms

## Herpes zoster ophthalmicus (Shingles)

Herpes zoster ophthalmicus is essentially shingles (reactivation of the varicella-zoster virus) in the ophthalmic branch of the trigeminal nerve (V).<sup>7</sup> All parts of the eye innervated by this nerve can be affected, causing conjunctivitis, keratitis and/or iritis, along with a periorbital vesicular rash, identical to a shingles rash seen elsewhere on the body. Although a shingles rash that involves the tip of the nose (Hutchinson's sign) is said to predict the development of herpes zoster ophthalmicus, one-third of patients without the sign have ocular complications.<sup>7</sup> Involvement of other cranial nerves such as II (optic neuritis), III, IV and VI (diplopia) may suggest central nervous system involvement and patients require neurological as well as ophthalmological assessment. Conjunctivitis and mild to moderate non-specific keratitis are common acute presentations, with sight-threatening corneal stromal or intraocular inflammation more likely to occur one to two weeks after the onset of vesicular rash.

Patients with suspected herpes zoster ophthalmicus should be started on oral acyclovir if they have presented within 72 hours of the onset of vesicular rash.<sup>7</sup> Patients with decreased visual acuity and/or corneal epithelial defect on fluorescein examination should be referred for same-day ophthalmological assessment.

## Dry-eye syndrome

Keratoconjunctivitis sicca, known as dry-eye syndrome, occurs when there is deficiency or dysfunction of the tear film that normally keeps the eyes moist and lubricated.<sup>18</sup> It is more common in females and incidence increases with age.<sup>18</sup> Decreased tear production is most often age-related, but can also be due to systemic auto-immune diseases (e.g. Sjogren's syndrome) or some medicines. Tear film dysfunction is often caused by blepharitis, altered lid position (e.g. ectropion), decreased blink rate (e.g. intense concentration, Parkinson's disease), incomplete lid closure, or environmental factors.<sup>18</sup>

Symptoms include a feeling of dryness, grittiness or mild pain in both eyes, which worsens throughout the day. Eyes water, especially when exposed to the wind.<sup>18</sup> Patients are often aware that blinking or rubbing the eyes relieves symptoms. Conjunctival injection is usually mild, and fluorescein staining typically shows punctate epithelial erosions, which occur due to desiccation on the lower part of the cornea where lid coverage is least. The erosions are very small and may not be seen without magnification.

Treatment includes eyelid hygiene (see: "Blepharitis", Page 20), the use of artificial tears and managing exacerbating factors, e.g. limiting use of contact lenses, avoiding smoking, taking frequent breaks when concentrating on a screen.<sup>18</sup> In some cases, punctal plugs are inserted into the lower or upper tear drainage canals of the eye, to reduce dryness.

Complications of dry-eye syndrome include conjunctivitis and keratitis.



are persistent despite chloramphenicol treatment.<sup>11</sup> If gonococcal conjunctivitis is suspected in an adult, collect an eye swab\* (before applying any topical treatment) and test for gonorrhoea and chlamydia.<sup>14</sup>

**Newborn infants:** If conjunctivitis is present in a newborn infant (aged  $\leq 28$  days), consider *Chlamydia trachomatis* or *Neisseria gonorrhoeae* as the cause, usually transmitted vaginally during birth. Refer the infant urgently to a Paediatrician; do not apply topical treatment. If the diagnosis is confirmed, parents will also require testing and possible treatment. Gonorrhoea can result in a sight-threatening eye infection and chlamydia can be associated with the development of pneumonia in young infants.<sup>11</sup> N.B. Infants who present with a "sticky eye", without conjunctival inflammation, are most likely to have poor drainage of the lacrimal duct rather than conjunctivitis, and this does not require urgent assessment.<sup>11</sup>

**Allergic conjunctivitis** is caused by a local response to an allergen, e.g. pollen, preservatives in eye drops or contact lens solution. Patients typically present with swollen, itching eye(s), irritation, mild photophobia and watery or serous discharge.<sup>1</sup> Symptoms are episodic in the case of seasonal allergies. Eversion of the lids often reveals a "cobble-stone" appearance of the tarsal (eyelid) conjunctiva because of the development of large papillae or swellings of the subepithelial stroma (connective tissue).

Treatment is supportive; avoid the allergen where possible, avoid rubbing the eyes, apply a cool or warm compress to relieve symptoms, use artificial tear eye drops if required. If symptoms are severe or other treatments are ineffective, prescribe antihistamine eye drops, e.g. levocabastine, or a mast cell stabiliser (takes several weeks for full effect), e.g. lodoxamide or cromoglicate sodium. Olopatadine eye drops combine antihistamine and mast cell stabilisation activity and are often effective. An oral antihistamine may also be prescribed, depending on patient preference and previous response to treatment.<sup>1</sup>

Patients with severe allergic conjunctivitis should have their visual acuity checked and a fluorescein examination, and then be referred to an Ophthalmologist for further assessment and possible initiation of topical corticosteroids. Vernal and atopic keratoconjunctivitis are two severe forms of allergic eye disease affecting children and young adults respectively, and can be associated with large epithelial defects on the cornea

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\* This is normally the same type of swab as used for genital testing for chlamydia and gonorrhoea – check with your local laboratory

(shield ulcers) that can lead to scarring, and also microbial keratitis – especially if topical immunosuppressants are being used.

### Foreign bodies and corneal abrasions

Patients with a foreign body in their eye or a corneal abrasion typically present with discomfort, watery discharge, pain associated with movement of the eye, blurring of vision and photophobia.<sup>5</sup>

The patient may be aware of the foreign body which has entered the eye or it may have occurred unnoticed during an activity such as chiselling, hammering, grinding metal or mowing the lawn. Corneal abrasion can occur due to an accidental scratch, e.g. with a fingernail or while removing or inserting contact lenses, or by rubbing the eye, e.g. in the presence of a foreign body.

Any patient with a penetrating eye injury (or suspected) should be referred immediately for ophthalmological assessment. If ocular penetration is not suspected, examine the eye to locate the foreign body, which may be on the conjunctiva or under the eyelid. N.B. Do not attempt to evert the eyelid if there is a possibility of a penetrating eye injury as the contents of the eye may prolapse.<sup>5</sup>

Fluorescein dye can be used to help to detect the object or an abrasion. Although patients with a penetrating injury should be referred for treatment, if the injury is missed, and the eye is stained, a penetrating injury will be seen as a dark stream (i.e. dye diluted by aqueous) in a pool of bright green (i.e. concentrated dye); this is known as the Siedel sign, although it may be difficult to see without a slit lamp.<sup>16</sup>

**To remove a foreign object from the eye**, first apply a topical anaesthetic, e.g. tetracaine. Oral pain relief with paracetamol or ibuprofen can also be given.<sup>16</sup> Depending on the nature and location of the foreign object, it may be able to be removed by irrigating the eye. If this is not adequate, use a sterile cotton-tipped swab. In some cases, a more precise tool, such as the bevelled edge of a sterile needle may be required.<sup>5</sup> This should always be held tangential (on an angle) to the surface of the globe, with the bevel facing the globe, to minimise the chance of corneal perforation. This method can be difficult without the magnification provided by a slit-lamp microscope – if unsure, arrange for the patient to be treated where a slit-lamp is available (Optometrist, hospital emergency department or Ophthalmologist).

If the object is embedded and cannot be removed, or if after the object is removed there is a large abrasion, corneal

opacity, rust ring (after removing a metal object), a distorted pupil or reduced visual acuity, refer for ophthalmological assessment.<sup>5</sup>

**To prevent a secondary infection**, in a patient with a corneal abrasion (including after removal of a foreign object) prescribe chloramphenicol 0.5% eye drops, one drop, four times daily, for seven days (or ointment, depending on patient preference). Fusidic acid eye gel 1%, one drop, twice daily, for seven days is an alternative.<sup>5</sup>

An eye patch or dressing is not necessary.<sup>12</sup> Contact lenses should be avoided until the abrasion has healed and ideally, until antibiotic treatment has finished. There is usually no need for prescription of anaesthetic drops; prolonged use can lead to corneal damage.<sup>15</sup>

Ideally, the patient should be reassessed in 24 – 48 hours. Refer for an ophthalmological assessment (or consider Optometrist triage) if the abrasion is not resolving, or if visual acuity deteriorates or pain increases.<sup>5</sup>

### Subconjunctival haemorrhage

Subconjunctival haemorrhage occurs when blood vessels in the space between the sclera and the conjunctiva rupture. This may be caused by blunt trauma to the eye, coughing, sneezing or straining. In some cases, it may be associated with atherosclerosis, bleeding disorders or hypertension.<sup>12</sup> Subconjunctival haemorrhage, while often dramatic in appearance, is usually harmless. It is not associated with any significant pain and does not affect vision – if the patient has significant pain, photophobia and reduced vision, reconsider the diagnosis and refer them for an ophthalmological assessment if uncertain.<sup>12</sup>

In most patients, subconjunctival haemorrhage will resolve without treatment in one to two weeks.<sup>12</sup> Use of artificial tears may relieve any discomfort. Check the patient's blood pressure and, if they are taking warfarin, it is recommended that their INR level is checked.<sup>12</sup>

### Episcleritis

Episcleritis is a local inflammation of the superficial top layer of the sclera.<sup>12</sup> Patients present with dilated superficial blood vessels in a localised area of the sclera, as opposed to conjunctivitis which appears more diffuse. Patients usually report mild pain only, discharge and photophobia are usually absent and vision is unaffected.<sup>12</sup> Localised tenderness is a helpful diagnostic feature.

Episcleritis resolves without treatment, within approximately three weeks. Artificial tears may be used to relieve discomfort,<sup>12</sup> and an oral non-steroidal anti-inflammatory drug (NSAID) such as ibuprofen, used if required. If symptoms worsen, consider the possibility of scleritis.

## Blepharitis

Blepharitis is a chronic inflammation of the margin of the eyelids, which can present in patients as a “red eye”, with burning, pruritis and discharge. It is frequently seen in older people, and people with rosacea and seborrhoeic dermatitis.<sup>17</sup> Blepharitis is caused by dysfunctional secretions of the Meibomian glands, oil-secreting glands in the eyelid margin which help the tears to distribute evenly across the ocular surface and decrease tear evaporation. These dysfunctional secretions lead to a chronic inflammatory state within the lid, and the resultant dysfunctional tear film leads to dry eye symptoms and signs (see “Dry-eye syndrome”). When diagnosing blepharitis, consider the possibility of squamous cell, basal cell or sebaceous cell carcinoma of the eyelid margin (marked eyelid asymmetry may indicate this), dermatitis or infection (e.g. impetigo).<sup>17</sup>

Treatment focuses on improving the Meibomian gland secretions, but is never curative and it should be explained to patients that management needs to be ongoing. As blepharitis is a chronic condition, relapses and exacerbations can be expected.<sup>17</sup>

The following regimen should be initially carried out twice daily, then as symptoms improve, once daily:<sup>17</sup>

1. Apply a warm compress to the closed eyelids for five to ten minutes
2. Gently massage the eyelid margin with a circular motion
3. Clean the eyelid with a wet cloth or cotton bud and rub along the lid margins; use a solution of 1 part baby shampoo to 10 parts water for cleaning

The use of cosmetics around the eye should be avoided, especially eye liner. Artificial tears may assist in relieving symptoms.

If the symptoms are particularly severe, topical antibiotics can be considered; chloramphenicol 0.5% eye drops, one to two drops, four times daily, for seven days (or up to six weeks in chronic cases).<sup>12, 17</sup> Fusidic acid eye gel 1% is an alternative. In some cases, oral tetracyclines, e.g. low dose doxycycline, may be considered if topical antibiotics have not resulted in an adequate response. Antibiotics are usually prescribed initially for six weeks, but may need to be continued for up to three months, and repeated intermittently.<sup>17</sup> Eyelid hygiene should be maintained throughout treatment.

Blepharitis does not permanently affect vision, as long as complications are adequately managed.<sup>17</sup> People with blepharitis have an increased risk of developing conjunctivitis and keratitis.<sup>17</sup> Long-term complications include loss of eyelashes (madarosis), misdirection of lashes towards the eye (trichiasis) and depigmentation of the lashes (poliosis).<sup>17</sup>

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