Common eye infections

SUMMARY

Not all red eyes are due to infections. Not all eye infections respond to antibiotic eye drops. Conjunctivitis is the most common eye infection. Most cases are viral and do not require antibiotic eye drops. Infectious keratitis is a cause of blindness. It is an emergency that requires specialist treatment. Infectious endophthalmitis is an emergency that has become more frequent with the use of intravitreal injections. Intravitreal antibiotics are needed to try and prevent visual loss.

Introduction

Eye infections are a common presenting problem in primary care. ‘Red eye’, ‘conjunctivitis’ and ‘corneal ulcer/keratitis’ were among the top five problems most commonly referred to two ophthalmology departments in Brisbane.1 To ensure a good visual outcome for the patient, the practitioner should make a prompt diagnosis and start appropriate treatment. Conjunctivitis typically does not threaten vision, but infections of the cornea or inside the eye are serious threats and require immediate referral to an ophthalmologist.

Infectious conjunctivitis

 Conjunctivitis is a common condition that causes dilation of the conjunctival blood vessels and results in inflammation. Figure 1 is an algorithmic approach to diagnosing and treating conjunctivitis, based on signs and symptoms.2 Both viral and bacterial conjunctivitis (Fig. 2) present with a red eye and are highly contagious. Assessment should include checking visual acuity and examination with a torch or slit lamp. Fluorescein drops should be instilled in the conjunctival sac and the eye viewed with the cobalt blue light of the slit lamp or fundoscope, to rule out any signs of corneal ulceration or infection (Fig. 3). A history of cold sores or shingles should be sought and the patient examined for cold sores or a vesicular rash in case the infection is due to herpes simplex or zoster virus.

Viral conjunctivitis

Viral conjunctivitis is the most common cause of infectious conjunctivitis. This infection is more common in adults than in children. Around 65–90% of cases are caused by adenovirus. Occasionally, herpes simplex or zoster virus is responsible. Patients can generally be advised that viral conjunctivitis is self-limiting and, as there are no specific treatments, for comfort they can use cold compresses, artificial tears or topical antihistamines.2,3 Antibiotics are not needed, are costly and may increase antibiotic resistance. If there is evidence of herpes simplex or zoster virus then antivirals should be prescribed, such as aciclovir ointment or ganciclovir gel. When viral conjunctivitis is severe or the patient experiences symptoms after its resolution, the patient should be referred to an ophthalmologist. This is to consider topical steroids and to exclude an immune ‘post-viral’ keratitis.

Bacterial conjunctivitis

Bacterial conjunctivitis, although a less frequent cause of conjunctivitis, is more common in children. The most common bacteria are Haemophilus influenza, Streptococcus pneumoniae and Staphylococcus aureus.4 Compared to placebo, the use of antibiotic eye drops is associated with improved rates of clinical and microbiological remission.4 A broad-spectrum topical antibiotic is recommended. The practitioner can select the most convenient or least expensive option, as there is no clinical evidence suggesting the superiority of any particular antibiotic.3,4 The initial treatment recommended by Therapeutic Guidelines: Antibiotic5 is:

- chloramphenicol 0.5% eye drops, one to two drops every two hours for the first 24 hours, decreasing to six-hourly until the discharge resolves, for up to seven days
- framycetin sulfate 0.5% eye drops, 1–2 drops every 1–2 hours for the first 24 hours, decreasing to eight-hourly until discharge resolves for up to seven days.

Chloramphenicol 1% eye ointment may be used at bedtime. Gentamicin, tobramycin and quinolone eye drops are not recommended for empiric treatment. If the condition does not improve within five days, the patient should be immediately referred to an ophthalmologist.
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**Fig. 1** Suggested procedure for clinical approach to suspected acute conjunctivitis

- **Suspected acute conjunctivitis**
  - Blurred vision? Pain? Photophobia?
    - Yes
    - Hyperpurulent
      - Gonococcal conjunctivitis*
    - No
      - Discharge?
        - Yes
        - Mucopurulent
          - Bacterial conjunctivitis (non-gonococcal)
        - No
        - Serous
          - Viral conjunctivitis
          - Allergic conjunctivitis
    - No
      - Itching?
        - Yes
        - Urgent ophthalmology referral
        - No
          - Itching?
            - Yes
            - Urgent ophthalmology referral
            - No
              - No

*Gonococcal conjunctivitis is mainly seen in neonates

**Fig. 2** Conjunctivitis

Note discharge at medial canthus.

**Fig. 3** Epithelial defect in a corneal graft viewed with fluorescein drops and cobalt blue light

The epithelial defect is stained green.
If infectious keratitis is suspected, the practitioner should take a history to look for risk factors such as contact lenses, corneal abrasions, physical and chemical trauma, refractive surgery, diabetes, immunosuppressive diseases and topical steroids. The type of infecting organism varies according to the climate and geographical region and the patient’s risk factors.

**Gonococcal conjunctivitis**

Conjunctivitis caused by *Neisseria gonorrhoeae* is uncommon but should be considered in neonates and sexually active young adults. If suspected, the practitioner should take conjunctival swabs for Gram staining and special culture for *Neisseria* species. Patients should be referred immediately to an ophthalmologist. Antibiotic therapy is the recommended treatment and ceftriaxone is the drug of choice. Additionally, patients should wash the infected eye with saline and add therapy to cover chlamydia.

**Chlamydial conjunctivitis**

Most cases of chlamydial conjunctivitis are unilateral and have concurrent genital infection. Symptoms usually include conjunctival hyperemia, mucopurulent discharge and lymphoid follicle formation. Patients with symptoms should be referred immediately to an ophthalmologist. Oral antibiotics such as azithromycin or doxycycline are effective treatments.

**Infectious keratitis**

Infection of the cornea (microbial keratitis) is an ophthalmic emergency requiring immediate attention as it can progress rapidly. It is a significant cause of corneal blindness and is one of the most common causes of visual impairment in working age adults. In the USA, about 30,000 cases of microbial keratitis are reported annually.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Common symptoms</th>
<th>Common signs</th>
<th>History</th>
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<tbody>
<tr>
<td><strong>Bacterial keratitis</strong></td>
<td>Pain, Photophobia, Tearing, Decreased or blurred vision</td>
<td>Redness, Discharge, Corneal ulcer, Corneal infiltrates, Hypopyon</td>
<td>Contact lens wear, Trauma</td>
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<tr>
<td><strong>Herpes simplex virus keratitis</strong></td>
<td>Pain, Decreased or blurred vision, Tearing, Itching, Photophobia</td>
<td>Redness, Discharge, Epithelial: Dendritic ulcer, Stromal: Stromal haze/opacity with or without ulceration, Scarring, Vascularisation, Endothelial: Stromal oedema, Keratitic precipitates</td>
<td>Labial cold sores, Prior keratitis</td>
</tr>
<tr>
<td><strong>Endophthalmitis</strong></td>
<td>Pain, Decreased vision</td>
<td>Redness, Hypopyon</td>
<td>Recent ocular surgery, Intravitreal injections, Trauma, Intravenous drug use</td>
</tr>
</tbody>
</table>
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examination and corneal scraping. These scrapings are sent for Gram stain and culture to identify the organism. To begin, treatment has to be empiric because the results can take over 48 hours, and the condition can progress rapidly with loss of vision or even the eye if treatment is not started.

Topical antivirals are the mainstay of treatment and options include monotherapy with fluoroquinolones (ciprofloxacin 0.3% or ofloxacin 0.3% 1-2 drops hourly for 48 hours, then every 4 hours until healed) or fortified aminoglycoside/cephalosporin combinations (fortified cefalotin 5% plus gentamicin 0.9% 1-2 drops hourly for 48 hours, then reduce frequency according to treatment response).

These regimens have similar effectiveness but fluoroquinolones reduce the risk of chemical conjunctivitis and ocular discomfort. Compared to ofloxacin, ciprofloxacin increases the risk of white corneal precipitates. Occasionally, corneal grafting may be needed to eradicate the organism or repair damage.

Chloramphenicol is the most common first-line antibiotic prescribed for red eye. It is a bacteriostatic broad-spectrum antibiotic but lacks activity against P. aeruginosa. Primary healthcare providers should not prescribe chloramphenicol when microbial keratitis is suspected as this delays appropriate treatment, with the risk of the patient losing vision or the eye.

Herpes simplex keratitis

Keratitis caused by herpes simplex virus is an important cause of infectious blindness in developed countries. The global incidence of herpes simplex keratitis was calculated at approximately 1.5 million with 40 000 new cases of severe monocular visual impairment or blindness per year. Herpes simplex keratitis can be classified as epithelial, stromal, endothelial or mixed, depending on which layer of the cornea is involved (Fig. 5). It may also be considered as primary or recurrent depending on whether it is the patient’s first episode. If suspected, the practitioner should ask about a history of cold sores or previous viral keratitis as this can be the first clue to the diagnosis.

The clinical features of herpes simplex virus keratitis (Table) can be identified on slit lamp examination. Epithelial herpes simplex keratitis typically manifests as a dendritic ulcer. To visualise the ulcer, fluorescein staining and a cobalt blue light are needed (Fig. 5).

The treatment is aciclovir ointment five times daily for 14 days.

Stromal herpes simplex keratitis presents with haze or opacity of the stroma, with or without ulceration, scarring or vascularisation. Endothelial keratitis is characterised by keratitic precipitates on the endothelium and corneal oedema.

Management of stromal and endothelial keratitis involves referral to an ophthalmologist for oral antivirals (aciclovir or valaciclovir), topical steroids and follow-up until the episode has resolved.

Infectious endophthalmitis

Endophthalmitis is an inflammation inside the eye that can be caused by infection with microbes, including bacteria or fungi (Fig. 6). The Table lists the clinical features. Endophthalmitis is an ocular emergency, requiring urgent referral to an ophthalmologist to prevent permanent loss of vision. It is a rare condition and its incidence depends on the cause.

Risk factors for endophthalmitis include cataract surgery, intravitreal injections (for age-related macular
Adverse effects of topical antibiotics

Bacterial infections are typically treated with antibiotic drops which may cause systemic adverse effects. The volume of commercial dispensers (25–50 microlitres) exceeds the capacity of the conjunctival sac (10 microlitres), therefore a large volume of the liquid drains out of the eye. This liquid may be systemically absorbed through different pathways including conjunctiva, nose, lacrimal drainage, pharynx, gastrointestinal tract, aqueous humour, lids, cheeks and inner ocular tissues. However, the risk of systemic absorption is low since ocular drug bioavailability is 5–10% and the corneal epithelium and conjunctival epithelium act as natural barriers limiting absorption.

Some adverse effects include skin irritation, itching or rash with sulfonamide, sulfacetamide and neomycin. Fluoroquinolones can cause local irritation, stinging, chemosis, conjunctival hyperaemia, corneal precipitations and alteration of taste.

A minimal dose and concentration of the antibiotic must be used in pregnancy to limit systemic absorption. Patients must be advised of punctal occlusion, nasolacrimal pressure and wiping away extra liquid to prevent systemic absorption.

Practitioners should refer to the ABCD pregnancy category before prescribing antibiotics to pregnant women. Antibiotics and antivirals such as chloramphenicol, tobramycin, fluoroquinolones and topical aciclovir are considered safe to use during pregnancy.

Conclusion

Patients with eye infections typically present with pain, blurred vision and a red eye. Conjunctivitis is the most common eye infection to present to primary healthcare providers and rarely threatens vision. Corneal infection (keratitis) and endophthalmitis are less common but pose a serious risk to vision. If the patient has a history of blurred vision, pain, photophobia, corneal opacity or hypopyon, specialist assessment is urgently needed.

Primary healthcare providers should avoid prescribing topical antibiotics for an eye infection unless the patient has bacterial conjunctivitis. Viral conjunctivitis is common and self-limiting. Urgent referral to an ophthalmologist for microbiological samples and treatment is needed for infectious keratitis and endophthalmitis.

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REFERENCES


