The conjunctiva is a thin, transparent, continuous mucous membrane that covers the inside of the eyelids (palpebral conjunctiva) as well as the sclera (bulbar conjunctiva). Inflammation of this structure is known as conjunctivitis and is the most frequently diagnosed cause of the acute red eye. It is estimated that the acute red eye contributes 1–4 per cent of disorders or problems seen in the primary-care setting.\(^1\)–\(^5\)

The condition varies in severity from mild hyperaemia and tearing to a severe conjunctivitis with copious purulent discharge. Rarely conjunctivitis is sight threatening causing irreversible scarring.

Conjunctivitis has been described as being clinically differentiated by symptoms and signs, \(\text{i.e.}\) discharge, conjunctival reaction, membranes and lymphadenopathy.\(^6\)

Clinical features (see Table 1)

Symptoms
Symptoms may be nonspecific such as tearing, discomfort, stinging or burning. Photophobia and blurring may be more indicative of conjunctivitis with corneal involvement or indeed an alternative diagnosis (see differential diagnosis section). The complaint of itch is often associated with allergic aetiology.

Signs
Discharge The character of the discharge varies with different causes. A watery discharge is typically associated with acute viral or acute allergic inflammation. A mucoid discharge is seen in keratoconjunctivitis sicca or vernal conjunctivitis, whereas a purulent discharge is seen in patients with severe acute bacterial conjunctivitis. A mucopurulent discharge is seen in mild cases of bacterial and chlamydial infections.

Conjunctival reaction The classical ‘red injected’ appearance is frequently maximal at the fornices. In bacterial conjunctivitis this is usually velvety and beefy-red. Chemoisis (oedema) occurs when there is severe inflammation of the conjunctiva and is commonly seen in allergic conjunctivitis.

With the aid of a slit lamp, a more detailed appearance of the conjunctival epithelium can be seen enabling differentiation between follicular and papillary conjunctival inflammation.
Follicular reactions can be described as multiple, slightly elevated lesions with the appearance of rice grains and most evident in the fornices (see Figure 1). Follicular reactions are commonly seen in viral and chlamydial infections.

In contrast, papillary reactions are nonspecific and can be seen in a variety of conditions including chronic blepharitis, allergic and bacterial conjunctivitis, and contact lens wear. Papillary reactions appear as a fine mosaic-like pattern of elevated polygonal hyperaemic areas often described as being like cobblestones (see Figure 2).

A useful distinguishing feature between follicles and papillae is the location of the blood vessels. In follicles the vessels are seen at the periphery of each follicle, while in papillae the vessels are seen in the centre.

Membranes
Pseudomembranes occur in severe cases of adenoviral and gonococcal conjunctivitis, ligneous conjunctivitis and Stevens-Johnson syndrome. These are coagulated exudates that can be easily peeled off the inflamed conjunctival epithelium. True membranes infiltrate the conjunctival epithelium and cannot be easily peeled off without pain and bleeding. These are commonly seen in Streptococcus pyogenes and diphtheria conjunctivitis.

Lymphadenopathy
Preauricular and submandibular lymph nodes are enlarged and tender in viral, chlamydial and gonococcal infections.

Differential diagnoses
Not every ‘red eye’ is ‘conjunctivitis’. Be wary, particularly in cases that are subacute in onset, not responding to treatment or that are associated with other symptoms such as reduced vision, photophobia, double vision or significant eye pain. Differential diagnoses include autoimmune causes (eg uveitis, mucous membrane pemphigoid – see Figure 3, thyroid eye disease, scleritis), orbital pathology (eg carotid cavernous fistulae or orbital masses obstructing venous outflow), severe dry eye, ocular neoplasia (eg conjunctival intraepithelial neoplasia), orbital cellulitis and acute glaucoma. In patients who are contact lens wearers, be alert to the possibility of contact lens-related corneal infection.

A previous history of ocular surgery such as corneal graft or glaucoma surgery should lower the threshold for referral to an ophthalmologist to assess for sight-threatening complications such as acute graft rejection or infection of the trabeculectomy bleb.

Types of conjunctivitis
Bacterial conjunctivitis
Bacterial conjunctivitis can be subclassified into two clinical types: acute (sometimes subacute) and chronic.

Acute bacterial conjunctivitis
Acute bacterial conjunctivitis is common and is characterised by rapid onset of conjunctival redness, mucopurulent discharge (see Figure 4), lid swelling and symptoms of grittiness or burning. The conjunctival injection is most intense in the fornices. The eyelids are frequently crusted and stuck together on waking due to exudate accumulation. Typically it begins in one eye and rapidly involves the second within days spreading by direct contact with infected secretions.
Common causative organisms include commensal skin flora such as *Staphylococcus epidermidis*, *Sta. aureus*, *Str. pneumoniae*, *H. influenzae*, *Moraxella catarrhalis* and Gram-negative intestinal bacteria. \(^7,8\) *H. influenzae* is the most common cause of conjunctivitis in young children, followed by *Str. pneumoniae* and *M. catarrhalis*. In contrast, *Sta. aureus* is the most common cause of conjunctivitis in neonates, older children and adults. \(^9\)

Bacterial conjunctivitis is usually self-limiting, taking up to two weeks to resolve. When treated with appropriate antibiotics the duration of the infection is shortened considerably to one to three days. A recent Cochrane systematic review concluded: ‘in patients with acute bacterial conjunctivitis, antibiotic therapy is more effective than placebo for early and late clinical and microbiological remission’. \(^10\)

The treatment of choice in the primary-care setting is a broad-spectrum topically applied antibiotic, such as chloramphenicol. Chloramphenicol should be prescribed two to three hourly for the first three days before reducing to four times daily for a week. Systemically administered chloramphenicol has been associated with serious haematological complications such as aplastic anaemia and ‘grey baby syndrome’. A link has not been established between this rare side-effect and topically applied chloramphenicol, although prescribing this medication to individuals with a personal or family history of haematological disorders has been advised against. \(^11-13\)

Fusidic acid (Fucithalmic) is a good alternative to chloramphenicol. It exists in a viscous suspension that leads to prolonged release and tissue concentration for more than 12 hours in tear film. Fusidic acid therefore only needs to be prescribed twice daily for a week. It has a narrower spectrum of coverage, however, being useful in staphylococcal but not Gram-negative infections.

Other topical preparations that can be used for acute bacterial conjunctivitis include fluoroquinolones such as ofloxacin (Exocin), ciprofloxacin (Ciloxan) and moxifloxacin (Moxivig). Moxifloxacin is a fourth-generation fluoroquinolone that works by inhibiting both DNA gyrase and topoisomerase IV. It provides enhanced activity against Gram-positive organisms (including resistant strains) compared to the earlier generation of fluoroquinolones while maintaining coverage against Gram-negative organisms.

When a Gram-negative organism is suspected, aminoglycosides such as gentamicin (Genticin) or tobramycin (Tobravisc) can be employed. Topical use of aminoglycosides, however, can cause corneal toxicity.

Two types of acute bacterial conjunctivitis that deserve special mention are gonococcal and meningococcal conjunctivitis, both of which can lead to serious ocular and systemic complications.

**Gonococcal conjunctivitis** is caused by *Neisseria gonorrhoeae*, which also causes venereal genitourinary tract infection. This organism and its subtypes (*N. meningitidis* and *N. kochii*) cause conjunctivitis that presents acutely with profuse purulent exudates and with eyelids being oedematous and tender. It is important to recognise and initiate treatment for this condition promptly as infection may have a rapid progressive course leading to corneal perforation, endophthalmitis and rarely septicaemia and meningitis. Investigations must include taking conjunctival swabs as well as blood cultures to exclude systemic involvement. Hospitalisation is indicated if there is corneal involvement due to the risk of corneal perforation.

The treatments of choice are intensive topical gentamicin and intravenous cephalosporin therapy. In addition, as it is a

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**Table 1.** Broad differential features of bacterial, viral, chlamydial and allergic conjunctivitis

<table>
<thead>
<tr>
<th>Type</th>
<th>Conjunctival reaction</th>
<th>Itching</th>
<th>Discharge</th>
<th>Lymphadenopathy</th>
<th>Associated fever and sore throat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacterial</strong></td>
<td>papillary</td>
<td>minimal</td>
<td>purulent</td>
<td>uncommon</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Viral</strong></td>
<td>follicular</td>
<td>minimal</td>
<td>watery</td>
<td>common</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Chlamydial</strong></td>
<td>follicular</td>
<td>minimal</td>
<td>mucopurulent</td>
<td>common in inclusion conjunctivitis</td>
<td>no</td>
</tr>
<tr>
<td><strong>Allergic</strong></td>
<td>papillary with chemosis</td>
<td>severe</td>
<td>watery</td>
<td>none</td>
<td>no</td>
</tr>
</tbody>
</table>

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**Figure 1.** Follicular conjunctivitis as seen in inclusion (chlamydial) conjunctivitis
sexually transmitted infection, patients must be referred to a genitourinary service to be screened for other infections including Chlamydia and sexual contact tracing.

Meningococcal conjunctivitis is usually seen in children and may be associated with life-threatening septicaemia and meningitis. Systemic prophylaxis with oral ciprofloxacin is required in addition to topical antibiotics for the eye.

Chronic bacterial conjunctivitis
Chronic conjunctivitis is defined as conjunctivitis persistent for a period of greater than three weeks. It may be due to localised bacterial accumulation caused by an anatomical obstruction such as nasolacrimal duct obstruction or due to chronic colonisation of organisms such as Staphylococcus aureus, which is associated with blepharitis and marginal keratitis. Identification of the underlying cause is essential in order to institute the appropriate treatment.

Another important cause of chronic bacterial conjunctivitis is chlamydial conjunctivitis. This condition, also known as inclusion conjunctivitis, is caused by Chlamydia trachomatis serotypes D to K. It is a sexually transmitted disease that commonly occurs in sexually active young patients, many of whom may have a concomitant genital infection (urethritis in males and cervicitis in females). Transmission is by autoinoculation from genital secretions by hand to eye or through oral-genital sexual practices.

Patients present with subacute-onset mucopurulent discharge or with a chronic nonresolving conjunctivitis (unilateral or bilateral), which when untreated can persist for up to 12 months. An important feature to recognise is chronic follicular conjunctivitis. There may be associated tender preauricular lymphadenopathy. Referral to a genitourinary clinic is imperative for management and sexual contact tracing.

Treatment in adults can be from a choice of: azithromycin 1g as a single dose or doxycycline 100mg twice daily for one to two weeks. In cases where tetracyclines are contraindicated, such as in children, erythromycin 500mg four times daily for one week is an alternative.

Neonatal chlamydial conjunctivitis usually occurs 5–19 days after birth with a mucopurulent discharge. As with adult inclusion conjunctivitis, infection is via genital secretions from passage through the birth canal. Therefore, it is important that the mother and her sexual partner(s) are investigated and treated. This type of conjunctivitis may be associated with systemic infection such as otitis, rhinitis and pneumonitis. It is therefore important to initiate systemic treatment once microbiological confirmation is obtained. Treatment is with oral erythromycin 25mg per kg twice daily for two weeks.

For chlamydial trachomatis topical treatment with azithromycin dihydrate (Azeter) has been licensed to be instilled twice daily for three days and found to be noninferior to oral azithromycin, even though it must be noted that this eye drop is to be used in conjunction with systemic cover.

Viral conjunctivitis
Adenovirus conjunctivitis Numerous types of virus can cause conjunctivitis, the most common being adenovirus. Adenovirus types 3, 4 and 7 cause pharyngeal conjunctival fever (PCF), while types 8, 19, 29 and 37 cause epidemic keratoconjunctivitis (EKC; see Table 2).

Patients initially present with redness, acute watering and discomfort. This is then often followed by photophobia from epithelial and subepithelial keratitis 5–14 days later. Patients may have associated tender preauricular lymphadenopathy, and in PCF patients also complain of fever and pharyngitis. Other features seen include follicular conjunctivitis, eyelid oedema, subconjunctival haemorrhages, chemosis and pseudomembranes in severe cases.

Transmission is highly contagious, spreading via respiratory and ocular secretions. Children and young adults usually acquire PCF whereas EKC is common in adults, though all age groups can be affected. The virus is shed for about 12 days following onset of conjunctivitis, and it is therefore important to emphasise the contagious nature of the condition to the patient. Appropriate advice should be given regarding hygiene practices to try to avoid spread to close contacts. Sick leave is required for those in closed environments such as schools, hospitals and offices to avoid spread during the period of viral shedding. It is imperative that all equipment that is used to examine the patient is meticulously disinfected.

Diagnosis is typically based on characteristic clinical features, though conjunctival swabs for viral serology or polymerase chain reaction (PCR) can sometimes be useful.
Allergic/toxic conjunctivitis

Allergic and toxic conjunctivitis are both caused by a humoral hypersensitivity reaction. This can be subdivided into allergic rhinoconjunctivitis, vernal keratoconjunctivitis, atopic keratoconjunctivitis and giant papillary conjunctivitis.

Allergic rhinoconjunctivitis (ARC) occurs in reaction to specific airborne antigens. This can be classified into seasonal and perennial ARC. Seasonal ARC is associated with the hay fever season when the pollen count is at its peak. Perennial ARC, however, occurs throughout the year, with exacerbations in the autumn when there is a high level of exposure to dust mites and fungal allergens. Patients present with a mild, itchy, watery papillary conjunctivitis (often chemotic) and lid oedema. This is associated with sneezing and nasal discharge.

Treatment is with topical applied mast cell stabilisers such as sodium cromoglicate, nedocromil (Rapitil) and lodoxamide (Alomide) or topical antihistamines such as azelastine (Optilast) twice to four times daily. Olopatadine (Opatanol) is particularly effective as it contains both an antihistamine and mast cell stabiliser; it is prescribed twice daily.

Vernal keratoconjunctivitis (VKC) is also known as ‘spring catarrh’ and ‘warm weather’ or ‘seasonal’ conjunctivitis. This self-limiting condition primarily affects prepubertal boys and young adults (up to 25 years of age) living in warm, dry climates. This IgE- and cell-mediated immune reaction is commonly seen in patients who suffer from atopic disease (eczema and asthma). Patients with VKC have a higher incidence of keratoconus and pellucid marginal degeneration. Patients commonly present with extreme ocular itching and ropy mucus discharge.

‘Cobblestone’ papillary conjunctivitis of the upper tarsal conjunctiva is a hallmark of severe vernal disease. These giant papillae are polygonal in shape with a flat top containing tufts of capillaries. Another characteristic sign can be seen at the limbal edge of the cornea in the form of Trantas dots, which are mucoid nodules with discrete white superficial dots. An arc of corneal scarring known as a pseudogerontoxon is seen following longstanding inflammation of a segment of limbus. Other corneal signs include diffuse epithelial keratitis as well as a superficial shield-like ulcer (oval and located superiorly), which can be complicated by bacterial infection.

The treatment of VKC is similar to ARC. Topical steroids such as fluorometholone (FML) or prednisolone 0.5 per cent are used in severe cases.

Atopic keratoconjunctivitis (AKC) typically affects young men with atopic dermatitis. The ocular manifestations are similar to but not the same as those of VKC, although occasionally this may be a direct sequel of childhood VKC. AKC persists for many years (unlike VKC) and is associated with high rates of significant visual morbidity. Keratoconus, presenile cataract and retinal detachment are frequently associated with patients suffering from AKC. Patients complain of symptoms similar to other forms of allergic conjunctivitis. Signs include chemosis, limbal hyperaemia and papillary conjunctivitis with eyelids being red, thickened, macerated and fissured. Chronic staphylococcal blepharitis is a common association (see Figure 6). Characteristic corneal signs include punctuate epithelial erosions, and in advanced cases

<table>
<thead>
<tr>
<th>Type</th>
<th>Adenovirus</th>
<th>Age</th>
<th>Pharyngitis</th>
<th>Keratitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCF</td>
<td>3, 4, 7</td>
<td>children and young adults</td>
<td>yes</td>
<td>30% of cases (seldom severe)</td>
</tr>
<tr>
<td>EKC</td>
<td>8, 19, 29, 37</td>
<td>all age groups</td>
<td>no</td>
<td>80% of cases (may be severe)</td>
</tr>
</tbody>
</table>

Table 2. Differential features of pharyngeal conjunctival fever (PCF) and epidemic keratoconjunctivitis (EKC)
persistent epithelial defects, shield-shaped anterior stromal scars and peripheral vascularisation are seen. Complications include aggressive herpes simplex keratitis and microbial keratitis.

Treatment in active AKC is similar to that of VKC but it must be noted that this condition is more persistent and will require prolonged therapy. Topical antibiotics are prescribed for associated staphylococcal blepharitis. Other topical therapy often includes preservative-free artificial lubricants (e.g., carmellose) as well as NSAIDs such as ketorolac (Acular) or diclofenac (Voltarol Ophtha).

Giant papillary conjunctivitis (GPC) is seen in patients with plastic artificial eyes or those wearing contact lenses. The signs and symptoms resemble those of VKC and this is thought to be a basophil-rich delayed hypersensitivity disorder (see Figure 7). When the condition is associated with contact lens wear, treatment may...
Prescription review

In 2013, GPs in England wrote 2.5 million prescriptions for topical antibacterial preparations for the eye at a total cost of £5.6 million. Chloramphenicol continues to be the most frequently prescribed agent, with 72 per cent of prescriptions. It is also the least expensive and accounts for 63 per cent of spending. Most of the remaining prescribing is for fusidic acid (Fucithalmic), another long-established antibiotic, with 22 per cent of volume and 24 per cent of costs.

Unit-dose preparations are relatively expensive. The high cost of levofloxacin (Oftaquix) is due to the unit-dose product, with an NIC per prescription of £31.72 compared with £8.37 for the 5ml eye drops (though the 5ml product is over three times more expensive than ofloxacin, the cheapest quinolone); unit-dose chloramphenicol costs £19.14 per prescription.

Table 3. Number and cost of prescriptions for antibacterial eye drops, England, 2013

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>No. scrips (000s)</th>
<th>NIC (£000s)</th>
<th>NIC per scrip (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>azithromycin</td>
<td>2</td>
<td>29</td>
<td>18.82</td>
</tr>
<tr>
<td>chloramphenicol</td>
<td>1 830</td>
<td>3 511</td>
<td>1.92</td>
</tr>
<tr>
<td>ciprofloxacin</td>
<td>61</td>
<td>349</td>
<td>5.70</td>
</tr>
<tr>
<td>fusidic acid</td>
<td>562</td>
<td>1 317</td>
<td>2.34</td>
</tr>
<tr>
<td>gentamicin</td>
<td>46</td>
<td>113</td>
<td>2.45</td>
</tr>
<tr>
<td>levofloxacin</td>
<td>7.3</td>
<td>115</td>
<td>15.81</td>
</tr>
<tr>
<td>ofloxacin</td>
<td>40</td>
<td>101</td>
<td>2.51</td>
</tr>
<tr>
<td>propamidine</td>
<td>2</td>
<td>5</td>
<td>3.11</td>
</tr>
</tbody>
</table>

Conclusion

Most cases of conjunctivitis presenting in the primary care setting are self-limited, typically resolving in two to three weeks. Studies have shown that antibiotic therapy will help hasten clinical improvement in cases of bacterial aetiology. However, it is important to note that there are various causes of conjunctivitis, and correct diagnosis in a timely fashion, with the appropriate treatment, is important to avoid irreversible complications. In cases where there is still no improvement to the ‘conjunctivitis’, it is important that a referral is made to the hospital eye services promptly.

When the use of topical steroid is deemed necessary, this should be under the supervision of an ophthalmologist to avoid worsening of undiagnosed infection, corneal melt or undetected glaucomatous visual loss.

References


Declaration of interests

None declared.

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