

## Allergic rhinoconjunctivitis and differential diagnosis of the red eye

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### ABSTRACT

*Red eye is a common presentation in clinical practice with conjunctivitis being the most common cause of red eye. Most commonly, conjunctivitis is infective (bacterial and viral) or allergic in origin although other forms of conjunctivitis including toxic and irritative conjunctivitis and conjunctivitis related to systemic conditions or dry eye are prevalent enough to warrant consideration in diagnosis. This article aims to provide a guide for generalists and allergists in the differential diagnosis of conjunctivitis allowing the inclusion of eye treatment into their current practice. With a discussion of important aspects to include in the patient history as well as a systematic guide to examination of the eye for generalists and allergists, this article provides a "plan of action" in the examination protocol for red eye patients. A differential diagnosis table and flowchart are provided as a useful chair-side reference for practitioners. With a particular focus on the more prevalent types of conjunctivitis, typical features, signs, and symptoms of each type are detailed. A general discussion of prognosis and treatment options and conditions that require ophthalmologic referral is included.*

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**Key words:** Allergy, blepharitis, chemosis, conjunctivitis, keratitis, photophobia, rhinitis, rhinoconjunctivitis, scleritis, uveitis

The diagnosis of red eye can be challenging, particularly in nonophthalmic medical practices. Inflamed eyes account for ~15% of consultations for ophthalmologists and almost 6% for general medical practitioners.<sup>1</sup> In those practices specializing in the treatment of allergy—where allergic conjunctivitis is predominately encountered—it is important to be able to differentially diagnose red eye. Although most cases can be effectively managed in a primary care setting, a thorough understanding of the disease process is essential in recognizing situations that require ophthalmologic referral. Not surprisingly, there is a strong association between allergic rhinitis and ocular allergy as documented by Berger *et al.*<sup>2</sup> This study found ~90% of patients with allergic rhinitis also had ocular allergic symptoms.<sup>2</sup> Truly, the proper way to think of ocular allergies is as part of an overall process, thus the name "rhinoconjunctivitis."

With its particular focus on conjunctivitis, this article aims to provide a guide for generalists and allergists in

the differential diagnosis of red eye allowing the inclusion of eye treatment into their current practice. A red eye indicates ocular inflammation. The term "red eye" represents a range of infectious or inflammatory ocular conditions involving one or more of the ocular tissues including the conjunctiva, cornea, lids, and internal ocular structures. Red eye is the most common ocular problem seen in the primary care practice.<sup>3</sup> In a survey of ophthalmologists and general medical practitioners in Europe, Petricek *et al.* determined that allergic conjunctivitis was the most common diagnosis of red eye (35%), followed by dry eye (25%) and bacterial conjunctivitis (BC; 24%).<sup>1</sup> Viral conjunctivitis (VC) is also considered a common ocular disease although statistics on its incidence are unavailable. For children the incidence of BC is much higher.

Conjunctivitis or inflammation of the conjunctiva is the most common cause of red eye. Conjunctivitis is typically allergic or infectious in origin. Infectious conjunctivitis is predominately bacterial or viral. Conjunctivitis can also be classified as hyperacute, acute, or chronic.

The conjunctiva is the clear mucous membrane that covers the anterior eye over the sclera, from the cornea, to the fornices under the eyelids (known as the bulbar conjunctiva). The conjunctival membrane then extends to cover the inner surface of the eyelids by turning back

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on itself at the fornices to become the palpebral and then the tarsal conjunctiva. The conjunctiva is richly supplied with blood vessels, lymphatics, and nerves and contains accessory lacrimal glands and goblet cells that release mucin into the tear film.<sup>4</sup>

The eye is one of the most sensitive organs of the body when it comes to manifesting allergic reactions. Airborne allergens can readily reach the conjunctiva. The misery associated with allergic conjunctivitis may include itching, redness, discharge, conjunctival swelling (chemosis), lid swelling, and discomfort. Some other diseases will have overlapping signs and symptoms. Attention to the nature of the discharge, the swelling characteristics, and the patient-reported symptoms assist in determining the nature of the conjunctivitis. Blepharitis—inflammation of the eyelids—is often associated with conjunctivitis. Other more serious inflammations of the anterior eye include keratitis, iritis, uveitis, episcleritis, and scleritis, each relating, respectively, to inflammation of the cornea, iris, uveal tract (comprising the iris, ciliary body, and choroid), episclera, and sclera.

## PATIENT HISTORY

The accurate diagnosis of a patient with red eye starts with a thorough ocular, medical, and medication history together with a systematic examination of the eye and surrounding tissue. In cases of red eye, a careful history will provide important background information and guide the clinical examination. Any symptoms of ocular pain, vision loss, or photophobia need to be referred to an ophthalmologist to rule out more serious conditions. Some patients with perennial symptoms and prolonged severe itching should also be seen by an ophthalmologist because of the possibility of atopic keratoconjunctivitis (AKC).

When there is a red eye, key questions to include in a patient history include,<sup>5,6</sup>

- When did the red eye start?
- Does it vary with location?
- Is there any discharge?
- What does it feel like?
- Is there any pain?
- How is your vision?
- Are you sensitive to light?
- Are you using medications including over-the-counter (OTC) meds?
- Do you wear contact lenses?
- Has there been trauma to the eye or history of a foreign body?
- Review the patient's medical history.
- Finally, ask about prior episodes and elicit any relevant family history.

These questions establish key symptoms that provide clues as to the diagnosis of the red eye. First, the

acuteness of onset as well as the chronicity of the condition and frequency of recurrences can be determined. The nature of the discharge and the subjective sensation experienced, *i.e.*, a burning, itching, or foreign body sensation, gives clues to the etiology. The contribution of systemic or OTC medications to the red eye can be established and information regarding any recent injury or foreign body can be gleaned. A history of contact lens wear increases the likelihood of corneal involvement. Pain is rarely associated with allergies.

## EXAMINATION

To examine the eye in the absence of a slit-lamp biomicroscope or ophthalmoscope, a magnifying instrument or magnifying loupe together with a penlight is very useful. An otoscope with the ear speculum removed can even be used. Taking a close look at the different external tissues of the eye individually provides information essential for differential diagnosis of the various etiologies of red eye. Clinical findings of concern are reduction in visual acuity, severe eye pain, photophobia, and blepharospasm (trouble keeping the eyes open). The presence of these signs warrants referral to an ophthalmologist.

Elements of the exam include,

**Visual acuity.** Check the visual acuity of each eye individually on the Snellen chart and note whether this is corrected or uncorrected (no spectacles). Visual acuity is, for the most part, unaffected in conjunctivitis unless there is an associated keratitis as in AKC. Keratitis, anterior uveitis, acute glaucoma, episcleritis, and scleritis all pose a serious threat to vision and require referral.<sup>7</sup>

**External eye and face.** Examine the eyelids for abnormalities including sores around the eye, swelling, or inflammation. Look for inflammation of the eyelid margins and for crusting at the base of the eye lashes. Note any asymmetry between the eyes and any ptosis (lid drooping) or blepharospasm. Eyelids may become swollen after exposure to an allergen or with insect bites. Chronic allergies may show the classic "allergic shiner."

**Conjunctiva and anterior eye.** Look next at the conjunctiva to determine if there is any swelling (chemosis) or hyperemia and to check for debris or obvious mucous in the tear film. The cornea should be clear with no grayish or milky white areas that may indicate ulceration or haze related to swelling. Check the iris appearance and test the pupils for normal responses. Examine the nature and amount of any discharge.

**Lid eversion.** Evert the top and the then bottom eyelids looking for papillae or follicles. Presence of these reflects the chronicity of the inflammatory response.<sup>8</sup> Follicles are gray, clear, or yellow bumps that vary in

size from pinpoint to 2 mm in diameter. They are usually associated with viral and chlamydial infection and have conjunctival vessels on their surface. Papillae, often seen in response to subacute or chronic inflammation, each contain a small tuft of blood vessels. Papillae are more commonly seen in chronic allergic eye disease.

**Location.** In differentiating conjunctivitis from more serious intraocular inflammation (iritis and uveitis), the location of the conjunctival redness is important. Diffuse conjunctival redness over the anterior ocular surface is more likely to be conjunctivitis. Redness in the immediate area around the circumference of the conjunctival-corneal border (the limbus) is called a "ciliary flush." It comes from the deeper ciliary circulation and could indicate inflammation within the eye or uveitis. Intraocular inflammation is more likely to be associated with pain and globe tenderness than conjunctivitis. In addition, there is usually no discharge with intraocular inflammation other than tearing.<sup>8</sup> Suspected ciliary flush requires ophthalmic referral. Early diagnosis of uveitis is the key to limiting the severity of the condition and to limiting complications. A localized area of redness on the conjunctiva may be related to a foreign body, trauma, episcleritis, or scleritis. Broad areas of redness, with loss of vessel detail, may represent a subconjunctival hemorrhage from trauma or a Valsalva maneuver.

**Preauricular nodes.** Viral and chlamydial inclusion conjunctivitis are often associated with an enlarged preauricular lymph node. A palpable preauricular node can also be associated with a toxic conjunctivitis secondary to topical medications. Palpable adenopathy is uncommon in BC with the exception of hyperacute conjunctivitis from *Neisseria* infection.<sup>3</sup>

**Ocular motility.** Cases where the entire extent of the eye lids are red and swollen, especially where there is pain and limited ocular motility, need to be referred to rule out orbital cellulitis.

## ASSESSMENT

Certain specific symptoms of conjunctivitis may assist in determining the etiology of the disease.

### Itching

The pathognomonic symptom of ocular allergy is itching. The itching may be mild or severe. Without itching, a condition is unlikely to be ocular allergy.<sup>9</sup> Mild itching may also be associated with blepharitis, dry eye, and, occasionally, infective conjunctivitis.<sup>3</sup>

### Discharge

A serous (watery) discharge is common in VC. In allergic conjunctivitis, it is serous and/or mucoid. It

tends to be mucopurulent in chlamydial disease and purulent/mucopurulent in bacterial infection. The overlap between these discharges makes this a "soft" sign.

## Unilateral or Bilateral Presentation

Allergic conjunctivitis usually presents with bilateral symptoms.<sup>10</sup> Viral and bacterial infections often present in one eye after direct contact with the microbe, the second eye becoming involved soon after. Acute closed angle glaucoma, iritis, herpes, and corneal abrasion are usually unilateral.

## Pain, Photophobia, and Reduced Vision

Pain, photophobia, and reduced vision are symptoms commonly associated with more serious ocular conditions including uveitis, keratitis, corneal abrasion, and acute closed angle glaucoma and should be referred for an ophthalmology workup. True photophobia alone is a good predictor of serious pathology<sup>11</sup> and may indicate uveitis or conditions where the cornea is compromised. Transient blurred vision after a blink may be caused by discharge in the tear film. The decision-making tree may assist in the differential diagnosis of red eye (Fig. 1).

## TYPES OF CONJUNCTIVITIS AND TREATMENT

### Allergic Conjunctivitis

The eye is particularly vulnerable to allergic response because of direct exposure of the ocular mucosal surfaces to environmental allergens. Ocular allergy affects an estimated 25% of the population of the United States (~50–75 million people).<sup>12</sup>

In general practice, treatment of rhinoconjunctivitis has understandably largely focused on nasal variables with the majority of rhinitis medications prescribed being either systemic antihistamines or intranasal corticosteroids,<sup>13</sup> although neither of these drugs adequately manage the ocular component of rhinoconjunctivitis.<sup>14,15</sup> The documented widespread use of OTC ocular allergy preparations, allowing patients to self-treat their ocular symptoms, indicates that current estimates probably underestimate the true incidence of allergic conjunctivitis.

Allergic conjunctivitis is a localized allergic condition that, despite its strong association with rhinitis, may be observed in isolation.<sup>16</sup> Symptoms include watery (88%), itchy (88%), red (78%) sore (75%), swollen (72%), and stinging (65%) eyes.<sup>17,18</sup> Allergists tend to see the most patients with this condition (25%), while 10% of patients treated by ophthalmologists have allergic conjunctivitis.<sup>12</sup> Ocular allergy may account for up to one-half of the red eye cases seen in clinical practice.

## Red Eye Algorithm - Dr D Granet

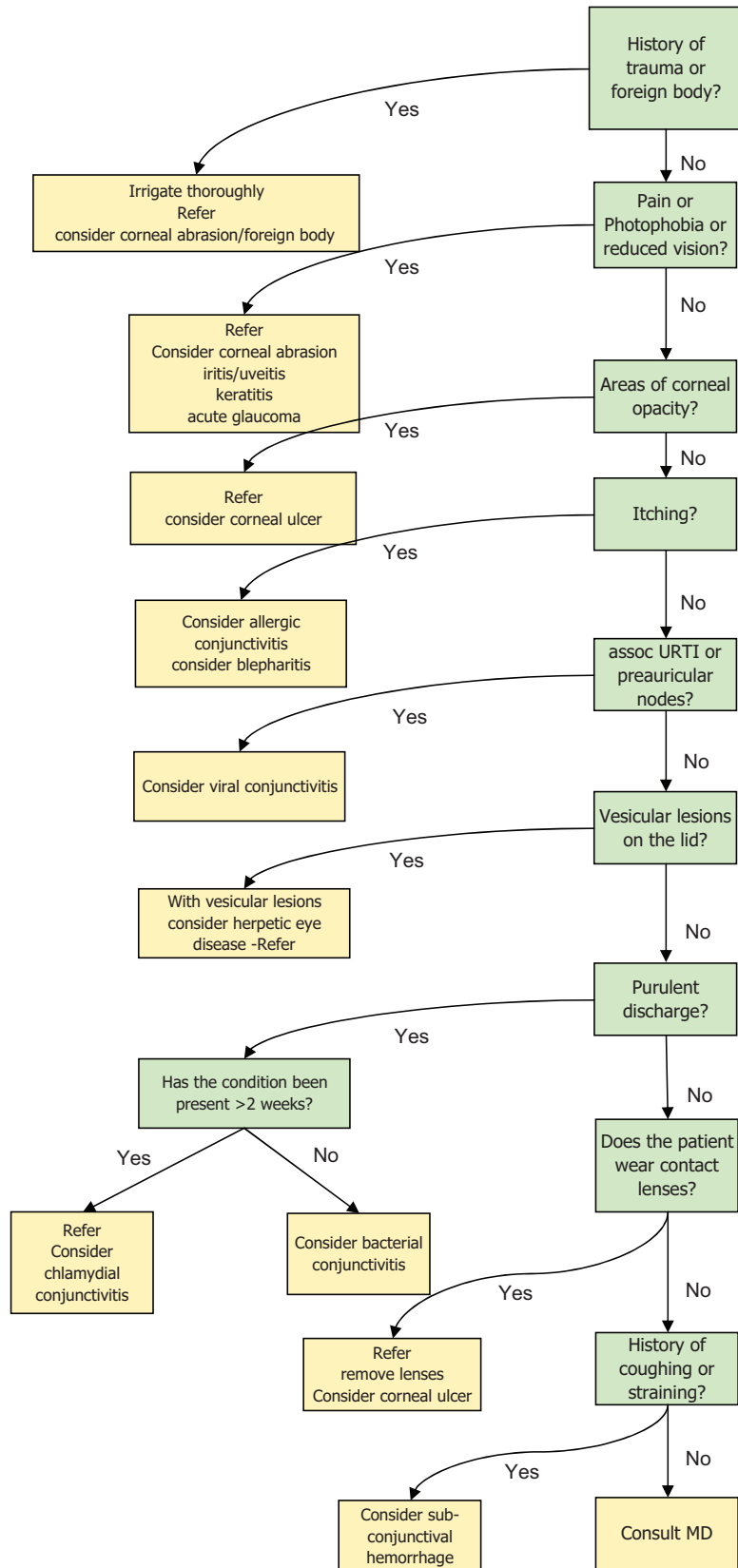


Figure 1. Decision-making tree.



Allergic conjunctivitis can be categorized into seasonal, perennial, AKC, and vernal keratoconjunctivitis (VKC). Seasonal and PAC are the most prevalent forms of ocular allergy accounting for 98% of all ocular allergies<sup>9</sup> and rarely lead to permanent effects on vision.

### Seasonal Allergic Conjunctivitis

Seasonal Allergic Conjunctivitis (SAC) represents one-half of all cases of allergic conjunctivitis.<sup>19</sup> SAC is caused by an IgE-mediated reaction to environmental air-borne allergens, such as grass and tree pollens. The hallmark signs and symptoms are seasonal onset of itching, redness, and lid swelling. Patients may also report burning with a watery discharge. A white exudate may form in the acute state that becomes stringy in the chronic form. In more severe cases, conjunctival chemosis may be present. Symptoms are usually bilateral. Individuals affected by SAC often have a history of atopy.<sup>19</sup>

Treatment could include systemic therapy if appropriate. Recall that antihistamines dry mucous membranes and may add to the ocular irritation in allergic conjunctivitis. Testing, education, and environmental changes should be implemented. Eye rubbing must be limited. Artificial tears and cold compresses are of limited usefulness.

OTC combined vasoconstrictor/antihistamines may be useful on a limited intermittent basis; their use can lead to a "medicamentosa" picture similar to that seen with nasal vasoconstrictors. Additionally, they should not be used in patients with narrow angle glaucoma.

Although individual treatment with topical ocular mast cell stabilizers or ocular antihistamines may effect improvement, there are better options. Dual mechanism topical treatments (those with antihistaminic and mast cell stabilizing properties) such as olopatadine 0.1%, ketotifen 0.025%, azelastine 0.05%, and epinastine 0.05% are the most commonly prescribed treatments. Understanding the biochemistry of these drugs helps explain their indications. Olopatadine has been the most commonly prescribed and most thoroughly researched of the aforementioned medications and is now available for once-daily treatment as olopatadine 0.2%. In these formulations, the rapid symptomatic relief provided by the antihistamine complements the long-term benefit of mast cell stabilization.

Topical corticosteroids are very effective for ocular allergies. Long-term use can cause glaucoma or cataracts. Lower dosages and short-term use is preferred. Generally, if the allergic reaction requires steroids, an ophthalmic referral is in order for regular monitoring.

### Perennial Allergic Conjunctivitis (PAC)

PAC is considered a chronic form of SAC. Seasonal exacerbations are noted in 79% of PAC sufferers.<sup>19</sup> It is

usually associated with perennial rhinitis. The signs and symptoms of PAC are burning, redness, and chemosis with a low level of itching.<sup>16</sup> Dust mites and animal dander are the most common allergens implicated in PAC.

The treatment for PAC is similar to that for SAC. Long-term treatment with dual mechanism antihistamine and mast cell-stabilizing eye drops may be necessary. Oral antihistamines are appropriate in the presence of concurrent, nonocular allergic signs. However, environmental changes will be essential to successful therapy.

### Vernal Keratoconjunctivitis

VKC is a chronic bilateral ocular inflammatory process that can cause severe inflammation and visual complications.<sup>20</sup> VKC has a seasonal incidence with most patients experiencing an aggravation of symptoms in the spring, although 60% of patients have repeat occurrences throughout the year.<sup>21</sup> The condition appears more frequently in children and young adults who have a history of seasonal allergy, eczema, and asthma. The incidence is higher in boys at an early age but evens out after puberty. VKC tends to "burn out" by the third decade of life.<sup>22</sup> Those affected by VKC experience intense itching exacerbated by exposure to wind, dust, bright light, or physical exertion. Symptoms also include photophobia, foreign body sensation, and tearing. The most prominent sign is giant papillae (7–8 mm in diameter) on the tarsal conjunctiva. Clinical signs often seen in association with VKC include the presence of a thin, white fibrinous discharge, yellowish-white dots on the conjunctiva/limbus (Trantas dots), and an extra lower eyelid crease (Dennie's line). Any corneal involvement, from areas of punctuate epithelial defects to ulcers, can compromise the cornea and predispose the patient to permanent vision loss.<sup>8</sup> VKC is mediated by eosinophils rather than the mast cell.

VKC may require management by an ophthalmologist because of the potential for corneal ulceration and scarring. Topical antihistamine/mast cell stabilizing eye drops, sodium cromoglycate together with cold compresses, and artificial tears are used to manage the signs and symptoms of VKC. Topical steroids may be required in more severe cases or during exacerbations. The intense itching is often associated with vigorous eye rubbing leading to degranulation of mast cells and heightening of symptoms. Patients should be counseled to avoid rubbing the eyes.

### Atopic Keratoconjunctivitis

AKC is a potentially severe chronic inflammatory condition involving the eyelid skin, cornea, conjunctiva, and lens of the eye. It can be defined as the ocular

manifestation of atopic dermatitis.<sup>23</sup> It appears in the late teens and progresses into the fifth decade with 25% of elderly people with eczema having some form of AKC.<sup>21,24</sup> Patients present with lid eczema, chronic blepharitis, meibomian gland dysfunction, dry eye, and, frequently, a staphylococcus infection. A hyperemic conjunctiva is associated with patient symptoms of intense itching, burning, and tearing present throughout the year with seasonal exacerbations. A mucous discharge is not uncommon. Long-term complications include conjunctival scarring, cataract, corneal involvement, including potential ulceration, and a predisposition to ocular herpes simplex infection. AKC can lead to blindness from corneal complications.<sup>16</sup>

As with VKC, the potentially sight-threatening nature of AKC warrants management by an ophthalmologist. Treatment includes the use of antihistamine/mast cell stabilizing eye drops and topical steroids. It is also important to treat associated blepharitis.

### Giant Papillary Conjunctivitis (GPC)

GPC is a chronic immune response to long-term exposure to foreign bodies in the eye such as deposits on ocular prostheses,<sup>25</sup> exposed sutures,<sup>26</sup> and elevated corneal deposits.<sup>27</sup> This can be thought of as contact dermatitis of the eyes. Contact lenses, particularly traditional reusable lenses that have the opportunity to build up deposits, are also implicated. Symptoms include mucoid discharge, itching foreign body sensation, and contact lens intolerance. Clinical signs include conjunctival redness and the development of Trantas dots. The chronic irritation to the upper eyelid with every blink contributes to giant papillae formation on the tarsal conjunctiva (>3 mm in diameter). There are similarities between GPC and VKC although GPC patients do not typically note the same level of itching and VKC sufferers are more likely to complain of intense itching.

Treatment involves removing or reducing contact with the source of the irritation. In the case of prostheses and contact lenses with surface deposits, replacement or, at the very least, improved cleaning is required. Consultation with the contact lens practitioner to refit the patient into more regular replacement lenses (*i.e.*, daily disposables) is beneficial. Lubricating eye drops assist in reducing symptoms of mild GPC. Where necessary, a mast cell stabilizer can help facilitate resolution of conjunctival changes.

Often, conjunctivitis is caused by a bacterial or viral infection. Sexually transmitted diseases such as chlamydial infection and gonorrhea are less common causes of conjunctivitis. However, these infections are becoming more prevalent and are important to recognize because of their significant associated medical complications and social consequences.

### Viral Conjunctivitis

In VC, the source may be one of many viral pathogens, including adenoviruses, picornavirus, or herpes simplex virus (HSV). HSV will be considered separately. VC is commonly associated with burning as opposed to itching. In addition to conjunctival hyperemia, there is typically tearing and a clear watery discharge.<sup>28,29</sup> Patients with VC may also experience fever, sore throat, and a follicular conjunctivitis. Palpation of the preauricular nodes may show adenopathy. Where pharyngitis and fever are present, referral may be necessary to rule out pharyngoconjunctival fever. Any ocular pain associated with VC may indicate corneal involvement and also requires referral to an ophthalmologist. VC is highly contagious and patients should be instructed in good hygiene practices to prevent cross contamination. The patient is considered contagious as long as there is a discharge (7–10 days). VC is usually self-limited and may not require treatment; however, with respect to the eye, treating viruses with antibiotics is common practice because of the difficulty identifying viral from BC. Cold compresses and topical vasoconstrictors may provide symptomatic relief.<sup>3</sup> Because of the risk of herpes simplex infection in VC, avoid topical steroids. Patients in whom conservative measures fail should be referred to an ophthalmologist.

### HSV Conjunctivitis (HSVC)

HSVC is characterized by unilateral injection, irritation, mucoid discharge, pain, and mild photophobia often accompanied by herpes vesicles on the skin around the eye. In most cases, the cornea is affected, resulting in herpes simplex keratitis characterized by discrete, dendritic (barbell shaped) epithelial lesions. Ophthalmologic referral is warranted to obtain topical antiviral therapy with trifluridine. It is important to note that topical steroids, used in specific cases of ocular inflammation, will facilitate rapid progression of this keratitis contributing to irreversible corneal scarring and must therefore be avoided. Among other reasons this again confirms why steroids should be used by ophthalmic experts.

### BC—Acute Form

Unilateral or more commonly bilateral ocular irritation and conjunctival redness with a mucopurulent (yellowish-green) discharge that is worse in the morning characterizes acute BC. It is an infective condition usually from a skin contaminant (*Staphylococcus aureus*) or a respiratory tract pathogen (*Streptococcus pneumoniae* and *Haemophilus influenzae*) where the eyes become red and inflamed. Infections with *S. pneumoniae* and *H. influenzae* are more common in children whereas *S. aureus* more frequently affects adults.<sup>10,30</sup>

Patients typically complain of acute onset of conjunctival hyperemia, purulent or mucopurulent discharge, ocular irritation, and encrusted eyelids or lashes that are stuck together on waking. Other symptoms include mild photophobia and moderate lid swelling. Dry eyes, history of a foreign body, chronic blepharitis, and history of upper respiratory tract infection may predispose a person to conjunctivitis. Although antibiotics are the mainstay of treatment for BC, it is usually self-limiting.

Treatment with topical broad-spectrum bactericidal antibiotics or ointment is highly effective. Because of increasing levels of resistance to older-generation antibiotics, fourth-generation fluoroquinolones (with a broader spectrum of kill and higher potency against Gram-positive cocci) offer the fastest resolution with the easiest dosing schedule of such topical medications.<sup>31,32</sup> If there is no significant resolution within 3 days with the use of a fourth-generation fluoroquinolone, or if there is recurrent infections, referral to ophthalmology is indicated.

Hyperacute BC is a severe, sight-threatening ocular infection most frequently caused by *Neisseria gonorrhoea* that warrants immediate ophthalmic referral because complications such as corneal ulceration, abscess, perforation, and blindness are common. The infection has an abrupt onset and is characterized by a profuse mostly purulent/mucopurulent discharge.<sup>33</sup> Symptoms include redness, irritation, and tenderness on palpation that are rapidly progressive. Examination reveals marked conjunctival injection and chemosis, dramatic lid swelling, and tender preauricular nodes. Gonococcal conjunctivitis occurs after direct contact with gonorrheal genital infection and although rare, may present in sexually active patients. It is also seen as a form of ophthalmic neonatorum in infants. Patients with gonococcal disease are commonly affected concurrently with chlamydia.<sup>34</sup> Gonococcal conjunctivitis may be treated with intramuscular ceftriaxone (Rocephin, Roche Laboratories, Nutley, NJ). Topical erythromycin or bacitracin may be used concomitantly.<sup>35</sup> Systemic treatment for chlamydia may be required.

### Chlamydia Conjunctivitis (CC)

The two forms of CC are trachoma—prevalent in developing countries—and inclusion conjunctivitis—primarily a sexually transmitted disease. CC due to *Chlamydia trachomatis* may cause a chronic conjunctivitis with a mild keratitis and in severe cases may lead to conjunctival scarring and blindness. Inclusion conjunctivitis is seen in exposed newborns but typically presents in young, sexually active persons after contact with infected secretions.<sup>36</sup> Initial presentation may include unilateral appearance, drooping of the eyelids,

mucopurulent discharge, photophobia, conjunctival hyperemia, and preauricular adenopathy. Conjunctival follicles may be observed.

This conjunctivitis does not respond to topical antibiotics. Referral to ophthalmology for laboratory testing and systemic antibiotic treatment is required. Treatment includes oral tetracycline, doxycycline, or erythromycin.<sup>37</sup>

## OTHER CAUSES OF CONJUNCTIVITIS

### Chronic BC and Blepharitis

This form of conjunctivitis develops in association with blepharitis, a common but often unrecognized inflammatory condition related to bacterial colonization of the eyelid margins. Symptoms of chronic BC can include itching, burning, a foreign body sensation, and morning eyelid crusting. The lid margins will appear inflamed, eyelashes may be irregular, and there may be visible flakes on the eyelashes. Conjunctival injection is therefore secondary to blepharitis. Patients may be prone to styes and chalazia (lipogranulomas from chronic inflammation). Inflammation of the oil-secreting meibomian glands located on the lid margin can cause a similar chronic conjunctivitis secondary to meibomian gland dysfunction. Dry eye symptoms are also common. Blepharoconjunctivitis and meibomianitis are a common feature of acne rosacea,<sup>38</sup> a condition to consider in adults with a history of facial flushing or other associated facial changes.

The treatment regime involves warm compresses and scrubs of the eyelid margins on a daily basis with a commercial eyelid cleanser until resolution of signs and symptoms. Topical antibiotics applied to the eyelid margins (Bacitracin or erythromycin ophthalmic ointment) are an option in more severe cases. Oral tetracycline or doxycycline is indicated in acne rosacea. Referral is warranted in nonresponsive cases.

Toxic conjunctivitis may occur as a side effect of any topical medication. It presents as a chronic red irritable eye with stinging on insertion of the drop. There may appear diffuse punctuate epithelial staining on the cornea. On occasion, contact lens wearers may also experience similar symptoms from sensitivity to certain contact lens disinfecting solutions. Topical agents for glaucoma are associated with a high rate of irritant hypersensitivity.<sup>39,40</sup> It is important to ask about the use of OTC topical medication as well as prescription medications in the patient history. It is not uncommon to see a red eye associated with the use of OTC decongestants or vasoconstrictors. Prolonged use of these drops can lead to a “rebound effect” in the conjunctiva. Overuse of these medications causes an increase in redness from vasodilation that may persist even after discontinuing the drops.

**Table 1 Summary of signs and symptoms of more common types of conjunctivitis**

Type and Subtype	Symptoms	Discharge	Signs	Preauricular nodes	History
Allergic					
Seasonal-acute	Itching	Watery	Mild conjunctival hyperemia- pink	No	Atopy
Perennial-chronic	Burning Lid swelling Conjunctival swelling				Seasonal allergen exposure
Vernal	Intense itching Foreign body sensation tearing	Thin, white fibrinous discharge	Papillae (7–8 mm-diameter) Trantas dots Dennie's Line	No	Seasonal allergy eczema asthma
Atopic	Intense itching Burning Tearing Lid eczema Chronic blepharitis	Mucous	Conjunctival hyperemia Conjunctival scarring Keratitis Associated with HSV infection and staphylococcus infection	No	Atopic dermatitis Males, 20–50
GPC	Mild itch Irritation Foreign body sensation	Mucous	Papillae >3 mm on tarsus	No	Chronic contact with deposits on lenses, prostheses, or sutures
Viral					
Adenoviral	Burning Irritation Tearing Red, swollen lids	Clear watery	Conjunctival injection- pink/purple near plica Follicular conjunctivitis	Usually	Fever Sore throat (strep)
Herpes simplex	Mild pain Irritation Photophobia	Mucoid	Dendritic ulcers Vesicles on eye lids Conjunctival injection	Occasional	Herpes simplex mouth ulcers
Bacterial					
Acute	Irritation Lid swelling Lids stuck together in morning	Purulent/ mucopurulent	Conjunctiva very hyperemic Papillae on palpebral conjunctiva	No	Hx. URI Dry eyes Family member affected
Hyperacute	Irritation Tenderness Lid and conjunctival swelling	Profuse purulent or mucopurulent	Conjunctival hyperemia Keratitis	Yes	Exposure to STD
Chronic	Mild itch Burning Foreign body sensation crusting	Mucopurulent	Mild conjunctival hyperemia Inflamed lid margins Irregular lashes Flakes at base of lashes	No	Styes and chalazia
Chlamydial					
Acute/chronic	Sometimes droopy lid Irritation Photophobia if keratitis	Mucopurulent/ stringy mucous	Conjunctival hyperemia Inf. tarsal conjunctivitis follicles	Likely–nontender	Exposure to STD
Dry eye					
Chronic	Red eyes Grittiness Itching Burning	Mucous	Mild conjunctival hyperemia		Sjögren's, RA, HIV, older age, hormonal changes, Medications

*HSV = herpes simplex virus; RA = rheumatoid arthritis; STD = sexually transmitted disease; URI = upper respiratory infection.*

Irritative conjunctivitis may occur because of environmental pollutants such as smoke and involves more scratchiness than itching. Irritative conjunctivitis patients may also have allergic conjunctivitis. Chlorine,

found in most pools, can cause a “swimmer’s eye” form of irritative conjunctivitis. This is worse in those with concomitant allergy. Environmental changes (*i.e.*, goggles) can assist in prevention of irritative conjunc-



tivitis. Treatment is most successful with antihistamine/mast cell stabilizer combination drops.

### Dry Eye

Keratoconjunctivitis sicca is a severe dry eye condition commonly associated with Sjogren's syndrome, rheumatoid arthritis, and human immunodeficiency virus infection.<sup>41</sup> However, milder dry eye is a common complaint among the general population, particularly in older age groups and in postmenopausal women. Computer users and long-term contact lens wearers may also be affected. Patients usually complain of a mildly infected eye with excess mucous production that may be confused with allergic conjunctivitis. Symptoms may also include grittiness, itching, or burning. Symptoms may worsen over the course of the day and are also affected by air-conditioning and forced heat. Long-term use of antihistamines as well as other medications with anticholinergic properties may also contribute to dry eye. Ocular lubricating drops, used as often as required to provide relief, are the first-line treatment for dry eye. If signs and symptoms of dry eye persist, referral to an ophthalmologist and the use of systemic medications is indicated.

### Molluscum Contagiosum

This virus may involve the eyelids and cause a toxic, chronic follicular conjunctivitis. The infection is characterized by umbilicated, nodular lesions on the lids as well as scaling of the eyelid skin. The shedding of viral particles into the eye causes a conjunctivitis accompanied by conjunctival redness and swollen lymphoid follicles in the lower conjunctival fornix. In cases of chronic conjunctivitis, examination of the eye may reveal the presence of molluscum lesions along the lid margins.<sup>42</sup>

### Other Considerations

As well as producing an eye ache, eyestrain may also produce sensations of dryness and irritation on the anterior eye from compromised conditions in the viewing environment. The subjective symptoms mimic those of dry eyes. The likely mechanism is that poor viewing conditions cause contraction of the orbital portion of the orbicularis oculi muscle, which causes eye lid squint in an attempt to improve vision. Eyestrain may also be caused by uncorrected refractive error or simply staring while reading or computer work. This has been shown to result in secondary reduction of the blink, thereby resulting in dry eye conditions.<sup>43</sup>

Systemic autoimmune disease such as AIDS (increased incidence of HSVC), Stevens-Johnson syndrome (conjunctival inflammation), cat scratch disease (Parinaud's oculoglandular syndrome—a chronic granulomatous conjunctivitis) and Crohn's disease (iri-

tis) may show ocular involvement with red eye (conjunctivitis secondary to autoimmune disease) and need to be considered in cases of recurrent inflammation.<sup>44</sup>

Contact lens wearers with red eye should be referred for exclusion of aggressive sight-threatening corneal infections such as *Acanthamoeba* and *Pseudomonas*. Contact lenses should be removed in all instances of red eye. Less serious cases of red eye in a contact lens wearer related to allergy or GPC can be managed in cooperation with the contact lens practitioner.

To summarize, determining the cause of a red eye is often a diagnosis of exclusion and history. It is important to be able to recognize those conditions that are sight-threatening or indicate underlying disease. Conjunctivitis is the most common form of red eye. Allergic conjunctivitis, BC, and dry eye are the most frequent forms of conjunctivitis and are rarely serious. Features of more serious disease include intense inflammation, pain, reduced visual acuity, progressive disease, and chronicity. Acute glaucoma, uveitis, and keratitis and/or corneal ulceration are among the most serious causes of red eye to rule out. These conditions tend to be unilateral, with pain, photophobia, and reduced vision and require immediate referral<sup>4</sup> (Table 1 shows conjunctivitis summary).

In conclusion, differential diagnosis of red eye can be challenging with many signs and symptoms overlapping. A thorough patient history and careful and systematic examination of the eye under magnification will be invaluable in the diagnosis.

Figure 1 and Table 1 are guidelines only. With any suspicion of more serious pathology, with no significant resolution within 3 days or if there are recurrent infections, referral to ophthalmology is indicated.

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