

Conjunctivitis



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KEYWORDS

- Conjunctivitis • Acute conjunctivitis • Chronic conjunctivitis • Viral conjunctivitis
- Bacterial conjunctivitis • Allergic conjunctivitis

KEY POINTS

- Conjunctivitis is the most common cause of red eye in primary care.
- The 3 most common types of conjunctivitis are viral, allergic, and bacterial, and they can present in either acute or chronic forms; the age of the patient, time of year and physical examination findings are paramount to distinguish the different types of conjunctivitis.
- Distinguishing between acute viral and bacterial conjunctivitis remains difficult. Patients with prolonged symptoms, poor response to initial management, or evidence of severe disease should be referred to ophthalmology for consultation.

INTRODUCTION

Conjunctivitis is a common complaint in primary care. It affects all ages and socioeconomic classes. Approximately 70% of patients with acute conjunctivitis present to their primary care provider or an urgent care center rather than to an ophthalmologist.¹ Research data have shown that 1% of all primary care office visits are related to conjunctivitis, which affects 6 million people annually in the United States.^{2,3} The economic impact is significant in terms of the cost of medical visits, cost of treatment, and lost work productivity. Bacterial conjunctivitis, which comprises about 50% of all cases of conjunctivitis, costs an estimated \$377 million to \$875 million annually in the United States.⁴

Acute conjunctivitis is usually a self-limiting condition that rarely causes permanent loss of vision. However, it is important to rule out other sight-threatening red eye diseases. Primary care providers need to be familiar with common differentials for the cause of a red eye (**Box 1**). Appropriate decision making for a timely referral to an ophthalmologist is paramount to ensure quality patient care (**Box 2**).

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Box 1 Common differential diagnosis of red eye
<ol style="list-style-type: none">1. Conjunctivitis2. Episcleritis and scleritis3. Corneal ulcer, abrasion, or foreign body4. Iritis5. Glaucoma6. Subconjunctival hematoma7. Chemical/flash burns8. Dry eye9. Blepharitis

A practical and systematic approach is needed to accurately diagnose conjunctivitis. This approach includes a medical history, a detailed ocular history, an ocular examination, a physical examination, and laboratory studies.⁵ An ocular history includes details about the type of discharge, presence of pain, itching, blurred vision, photophobia, corneal opacity, and eyelid characteristics. An ocular examination includes measured visual acuity, pupillary responses, extraocular motility, confrontation visual fields, an external eye examination, and a slit-lamp examination. An ocular examination in the primary care setting is limited because of lack of a slit lamp. However, useful clinical findings such as presence and type of discharge, conjunctival injection, or hypertrophy may be obtained with a simple penlight.⁶

DEFINITION

The conjunctiva is a transparent lubricating mucous membrane that covers the surface of the globe (bulbar) and the undersurface of the eyelid (palpebral) (Fig. 1). Conjunctivitis is inflammation or infection of the conjunctiva. It may be infectious or noninfectious.

Infectious conjunctivitis can have diverse causes, such as bacterial, viral, chlamydial, fungal, and parasitic. Causes of noninfectious conjunctivitis include allergens, toxicities, and irritants. Common bacterial pathogens include of *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, and diphtheria. Common viral agents include adenovirus,

Box 2 When to refer to ophthalmology
<ol style="list-style-type: none">1. History of a foreign body or trauma2. Ciliary flush3. Asymmetric or nonreactive pupil4. Copious, rapidly progressive discharge5. Qualitative loss in visual acuity6. Inability to open eye or keep it open7. Corneal opacity8. Marked pain or photophobia

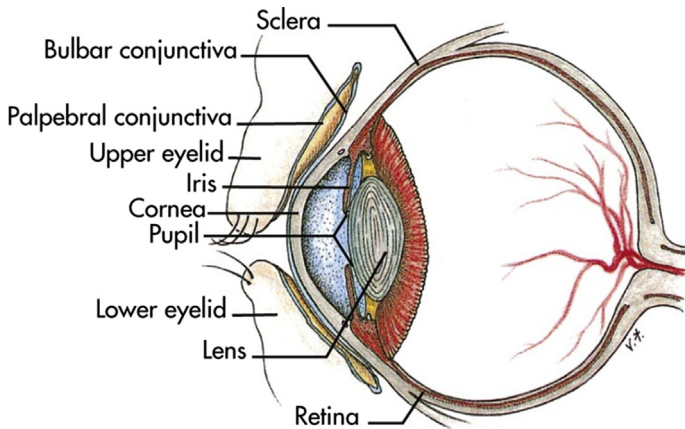


Fig. 1. The anterior segment of the eye. *From Potter PA, Perry AG. Fundamentals of nursing. 7th edition. St Louis (MO): Mosby; 2009; with permission.*

herpes simplex, herpes zoster, and enterovirus. Allergic conjunctivitis encompasses conditions to include seasonal allergic conjunctivitis, perennial allergic conjunctivitis, vernal keratoconjunctivitis (VKC), atopic keratoconjunctivitis (AKC), and giant papillary conjunctivitis. Examples of toxin-induced and irritant-induced conjunctivitis include contact lens-related keratoconjunctivitis, floppy eyelid syndrome, and medication-induced keratoconjunctivitis.

Conjunctivitis can be further divided into acute or chronic types. Acute conjunctivitis is characterized by onset within 3 to 4 weeks of the presentation and chronic is defined as more than 4 weeks in duration.⁷

A distinction between acute and chronic conjunctivitis can be drawn from an assessment of the discharge appearance, physical examination findings, and associated symptoms ([Table 1](#)).

PREVALENCE AND INCIDENCE

The prevalence of conjunctivitis varies according to the underlying cause, which may be influenced by the patient's age, as well as the season of the year.⁶ Allergic conjunctivitis is the most frequent overall cause, affecting 15% to 40% of the population, and

Symptoms	Allergic Conjunctivitis	Bacterial Conjunctivitis	Viral Conjunctivitis
Appearance of eye discharge	White stringy mucoid	Mucopurulent	Watery
Presence of erythema	Mild to moderate	Moderate to severe	Mild to moderate
Pruritus	Moderate to severe	None to mild	Mild to moderate
Bilateral eye involvement	Common	Unilateral initially	Rare
Presence of lymphadenopathy	None	Rare	Common
Upper respiratory coinfection	None	Rare	Common

Adapted from Cronau H, Kankanala RR, Mauger T. Diagnosis and management of red eye in primary care. Am Fam Physician 2010;81(2):139.

is observed most frequently in the spring and summer.⁸ Approximately 20% to 70% of infectious conjunctivitis is thought to be viral and 65% to 90% of viral conjunctivitis is caused by adenovirus and is most prevalent in the summer.⁶ Bacterial conjunctivitis is the second most common cause of infectious conjunctivitis and is responsible for most cases in children. It is most frequently observed from December to April.⁷ *N gonorrhoeae* is the most common bacterial pathogen in neonates, *H influenzae* is most common in infants and toddlers, and *S aureus* is most common in school-aged children and adults⁵ (Box 3).

Patient education and hand washing are essential to preventing the spread of contagious conjunctivitis. Conjunctivitis is associated with several conditions and comorbidities (Box 4).

Physical Examination

Obtaining the visual acuity of the patient is the first step in assessing the severity of the condition. Visual acuity can be obtained in a primary care setting with the patient wearing current glasses, if applicable, and holding a near vision card 41 cm (16 inches) away from the face. In patients more than 45 years of age, reading glasses might be required for near vision. The pupils should be assessed for equality and reactivity to light. If abnormal, the patient should be referred to ophthalmology emergently (see Box 2).

It is important to evaluate the periorbital area for signs of swelling and erythema that might indicate orbital or periorbital cellulitis. The eyelid skin and lashes should be examined for signs of vesicular lesions, discharge or blepharitis, and loss of lashes. Loss of eye lashes could indicate sebaceous gland carcinoma, whereas vesicular lesions can point to herpetic viruses as the cause of inflammation.

The next step of the examination is to recognize the different types of discharge: purulent, mucopurulent, or watery. Purulent discharge is usually hyperacute and reforms as soon as it is cleared from the eye. Mucopurulent discharge is adherent to the eyelashes and has a higher mucus content (Fig. 4). Watery discharge is mostly clear and can be copious (Fig. 5).

The examiner should be comfortable pulling on the lower lid and everting the upper lid to examine the palpebral conjunctiva. The presence of follicles, papillae, or membranes is another important tool in diagnosis. Follicles are small yellowish elevations of lymphocytes and are usually seen in the lower cul-de-sac at the junction of the palpebral and bulbar conjunctiva (Fig. 6). A follicular response is usually seen in conjunctivitis caused by adenovirus and chlamydia. Papillae are small conjunctival elevations with central vessels and can be readily appreciated under the superior tarsal conjunctiva (Fig. 11). A papillary reaction could indicate the presence of allergic conjunctivitis and contact lens intolerance. Conjunctival membranes can form in cases of severe infection. The membrane consists of a yellow to whitish colored fibrin layer that is

Box 3
Risk factors

1. Age: children have the highest incidence
2. Seasonal allergies
3. Exposure to known allergens
4. Sharing towels or linens with a person who has conjunctivitis
5. Use of contact lenses

Box 4
Comorbidities

1. Dry eye syndrome
2. Blepharitis or meibomian gland dysfunction
3. Trachoma
4. Contact lens intolerance or overusage
5. Lacrimal infection: chronic dacryocystitis, chronic canaliculitis
6. Masquerading syndromes: intraepithelial neoplasia, malignant melanoma, sebaceous cell carcinoma
7. Superior limbic keratoconjunctivitis
8. Floppy eyelid syndrome

adherent to the underlying conjunctival tissue (**Figs. 9 and 10**). The underlying tissue can be friable when the membrane is gently removed with a sterile cotton applicator. This finding indicates a more severe inflammatory response.⁹

The examiner should strongly consider performing a Wood lamp examination with fluorescein staining to fully evaluate the cornea. Subtle findings such as herpes simplex virus (HSV) keratitis can be missed without this type of examination. HSV keratitis can present similarly to adenoviral conjunctivitis with watery discharge and absence of skin lesions. Fluorescein staining can reveal the classic corneal dendrites (**Fig. 2**).

Eyelid cultures and cytology should be obtained in cases of conjunctivitis that are resistant to treatment in infants and children and, in cases of hyperacute purulent conjunctivitis, in adults. In general, a topical anesthetic is not required when taking a sample from the skin or the exudates on the eyelids. If a conjunctival sample is indicated, a drop of proparacaine ophthalmic eye drop can be instilled for comfort. Rapid adenoviral testing is available to confirm the diagnosis of epidemic keratoconjunctivitis caused by adenovirus¹⁰ (**Fig. 3**).

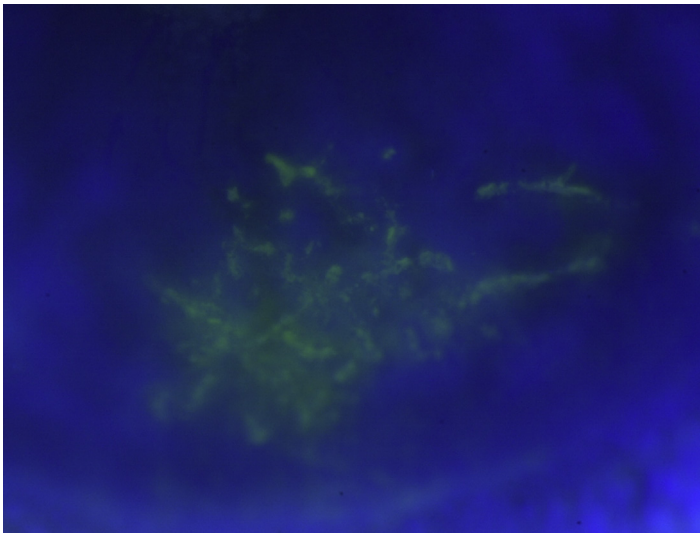


Fig. 2. HSV corneal dendrites stained with fluorescein and viewed under a Wood lamp. (Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.)

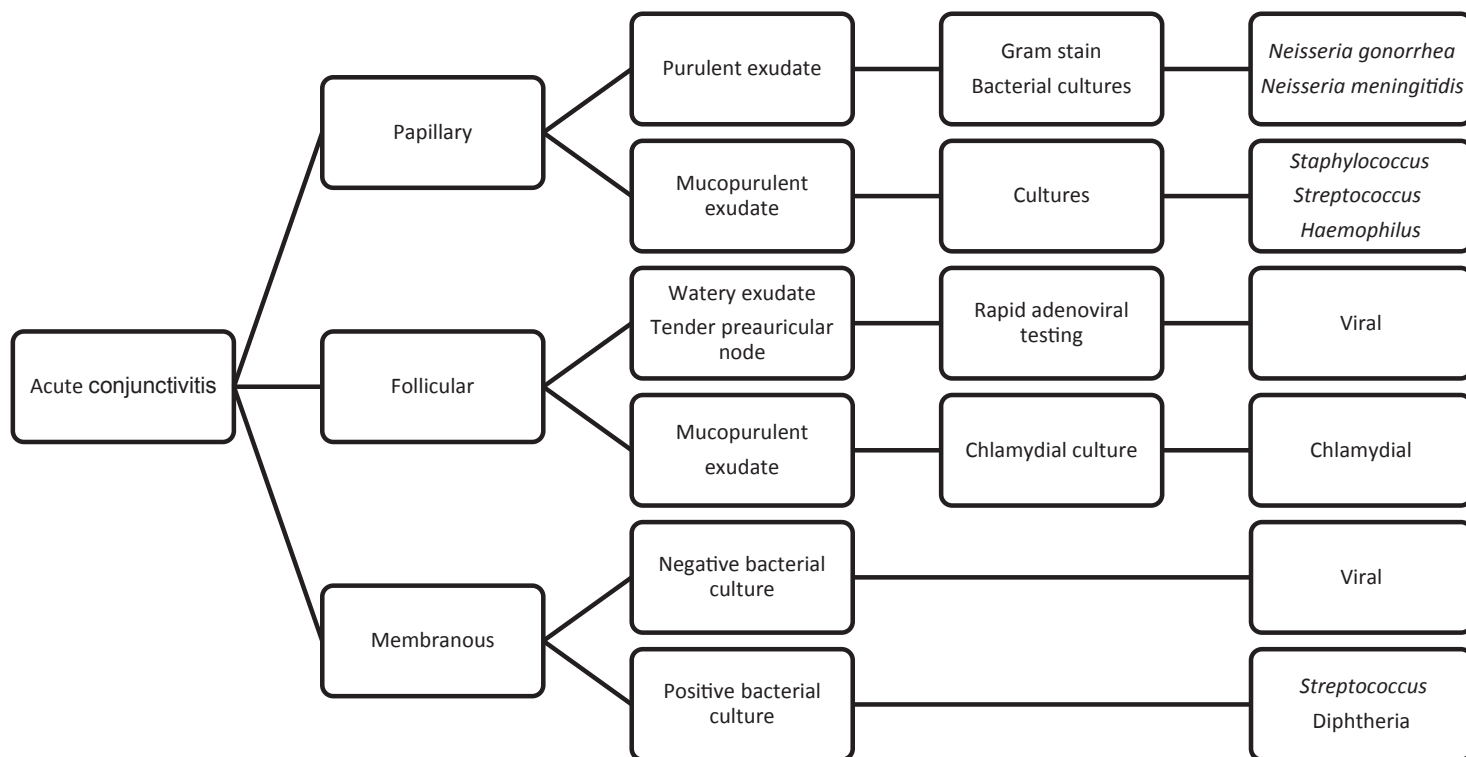


Fig. 3. Acute conjunctivitis. (Adapted from Buttross M, Stern GA. Acute conjunctivitis. In: Margo C, Hamed LM, Mames RN, editors. Diagnostic problems in clinical ophthalmology. Philadelphia: WB Saunders; 1994.)

CASE STUDY 1

A 9-month-old boy presents with a 2-day history of right eye redness. The mother states that the boy initially rubbed the eye profusely. She also notes increased yellowish discharge from the eye. The patient is otherwise healthy and up-to-date on his vaccinations. He recently started daycare.

Comments

This is a young child with a history of unilateral acute conjunctivitis.



Fig. 4. Acute conjunctivitis of the right eye with mucopurulent discharge. (Courtesy of Diana Shiba, MD, South Pasadena, CA.)

On Examination

The boy appears to be able to fixate and follow objects with the right eye. The puslike discharge is adherent to the lashes but not copious (see [Fig. 4](#)). The periorbital area is slightly swollen and erythematous. It is difficult to determine whether there are papillary, follicular, or membranous changes on the conjunctiva because of the child's uncooperativeness.

Comments

The patient is presenting with mucopurulent discharge, which suggests a viral or bacterial cause that may include gonococcus, meningococcus, or chlamydia. It is important to obtain cultures of the skin and the exudate, but this can be performed without anesthetics and with minimal trauma.

Treatment

After obtaining cultures, initial treatment consisted of topical erythromycin ophthalmic eye ointment applied 4 times daily. After a few days, the culture tested positive for pan-sensitive *S aureus*.

Comments

Topical steroid or steroid combination drops should be avoided for several reasons in this case. Without the culture result, steroid eye drops can potentially worsen the

infection. Topical steroids can have serious side effects that include glaucoma and cataract formation. The patient should be followed closely while on the appropriate antibiotic treatment. Periorbital cellulitis has been known to develop from conjunctivitis in young children. If there is any suspicion of periorbital cellulitis, the patient should be referred to ophthalmology emergently and treated with systemic antibiotics.

CASE STUDY 2

A 39-year-old woman presents with a 5-day history of a watery right eye (see [Fig. 5](#)). She has recently traveled on an airplane and is nursing a cold. She complains of progressively increasing watery discharge and itching. Otherwise, she is healthy.

Comments

This is a case of acute unilateral conjunctivitis.

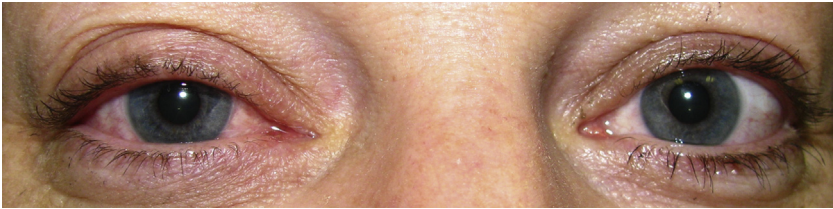


Fig. 5. Acute conjunctivitis of the right eye with watery discharge. (Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.)

On Examination

The patient's vision is normal. The palpebral conjunctiva shows evidence of follicular changes that are soft yellowish congregations of lymphoblasts (see [Fig. 6](#)). Follicles are usually easily seen in the lower palpebral conjunctiva.⁹ The exudate appears watery. On palpation, she reports tenderness in the preauricular area.

Comments

The patient presents with classic symptoms and findings of viral conjunctivitis. The most common viral agent is adenovirus, which can also cause the common cold. The diagnosis can be confirmed with rapid adenoviral testing if needed.

Treatment

The patient prefers to treat her symptoms with conservative measures, which include cool compresses and chilled preservative-free artificial tears.

Comments

Patients with viral conjunctivitis should be educated on the contagious nature of the disease. They should practice frequent hand washing, avoid social activities, and avoid sharing personal items. The US Centers for Disease Control and Prevention recommends 2 weeks of patient contact avoidance for health care workers.⁹ In most cases of viral conjunctivitis, topical steroids should be avoided because they can prolong viral replication and viral shedding. Misdiagnosis of HSV infection and superinfections are also of concern. However, topical nonsteroidal eye drops can be considered for comfort because they have no effect on viral replication or shedding. Antibiotic eye

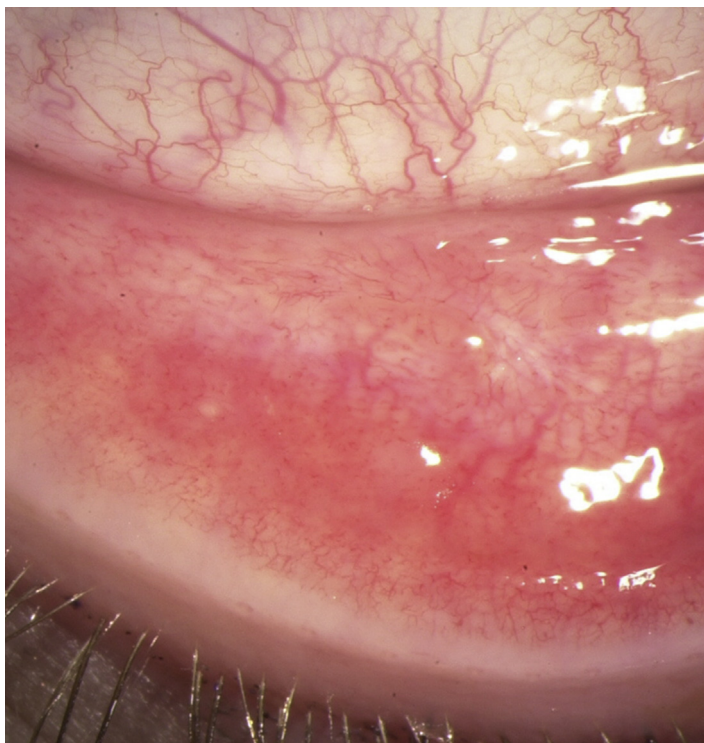


Fig. 6. Follicular changes on lower palpebral conjunctiva. (*Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.*)

drops are not indicated in viral conjunctivitis because secondary infection is a very rare occurrence.⁹

CASE STUDY 3

A 17-year-old white boy presents with a 2-week history of left eye redness. He was treated at an urgent care clinic 1 week ago with topical tobramycin eye drops, which did not improve his symptoms. He complains of redness, eye irritation, and discharge that sticks to the eye lashes.

Comments

The patient presents with acute unilateral conjunctivitis. His symptoms have not improved despite a course of antibiotic treatment. The differential diagnosis includes viral or atypical bacterial infections.

On Examination

The patient has normal vision. The patient has mucopurulent discharge from the left eye with no involvement of the right eye (**Fig. 7**). There appear to be follicles in the inferior conjunctiva (**Fig. 8**). Eyelid cultures are obtained to check for adenovirus, bacteria, and chlamydia. The results are positive for chlamydial antigens.

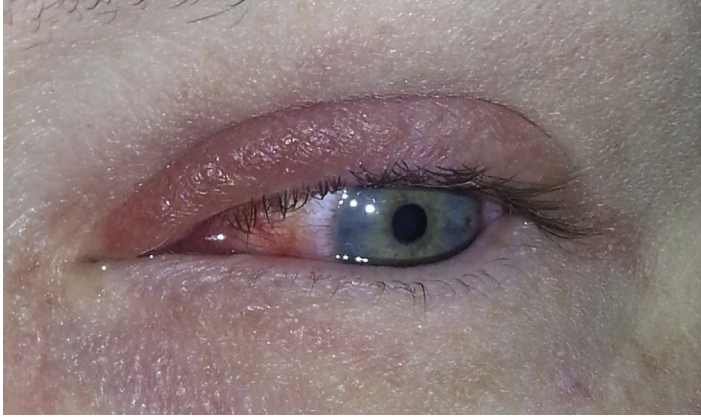


Fig. 7. Acute conjunctivitis of the left eye. (*Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.*)



Fig. 8. Left eye inflamed conjunctiva. (*Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.*)

Comments

Inclusional or chlamydial conjunctivitis is unilateral and can self-resolve in 6 months. Eyelid cultures should be obtained in the case of unresolving conjunctivitis despite adequate treatment.

Treatment

The patient should be started on systemic oral antibiotics such as doxycycline for 1 to 2 weeks or 1 dose of azithromycin.

Comments

Chlamydial conjunctivitis should be considered a systemic disease requiring systemic treatment. Topical treatment is not necessary. The patient should be counseled regarding safe sex practices and the contagious nature of the disease. His sexual partners should also be examined and treated.

CASE STUDY 4

A 50-year-old female kindergarten teacher presents with a 5-day history of red eyes. The patient states that the redness began with the right eye then progressed to the left eye. She has had blurry vision in the last few days with increasing discharge and irritation. She had a recent episode of an upper respiratory infection. The symptoms have not improved with artificial tears.

Comments

This is a case of acute bilateral conjunctivitis. The cause could be viral, bacterial, or atypical bacterial.

On Examination

The patient has vision of 20/60 in both eyes. She has bilateral conjunctival membranes (see [Fig. 9](#)) and a tender right preauricular node. Membranes are inflammatory fibrin exudates attached to the underlying conjunctival epithelium (see [Fig. 10](#)). Eyelid cultures were taken. An appointment is scheduled with an ophthalmologist.

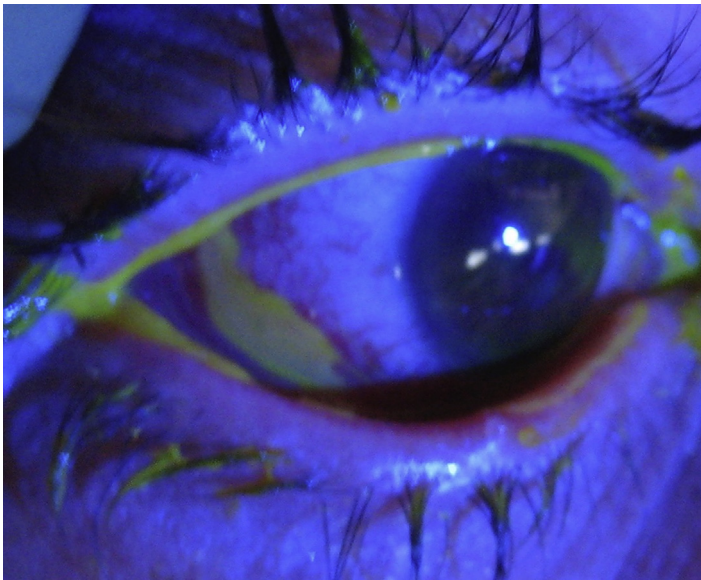


Fig. 9. Membrane on the right temporal bulbar conjunctiva. (Courtesy of Diana Shiba, MD, South Pasadena, CA.)

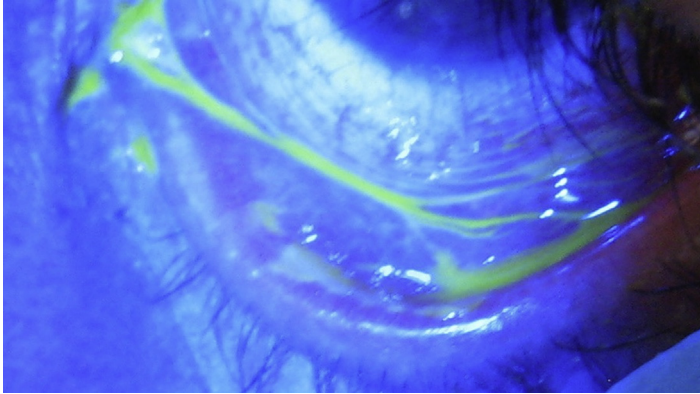


Fig. 10. Membrane on the inferior palpebral conjunctiva. (Courtesy of Diana Shiba, MD, South Pasadena, CA.)

Comments

Bilateral membranous conjunctivitis is a severe condition. The infectious agents could be viral, streptococcal, or diphtheria. A negative bacterial culture could indicate adenoviral infection. The sequelae can include severe conjunctival scarring and severe dry eyes. Prompt referral to ophthalmology is indicated.

CASE STUDY 5

A 40-year-old man presents with red and itchy eyes for more than 6 months. They usually have stringy clear discharge. He has been self-treating with over-the-counter vasoconstricting eye drops with no improvements.

Comments

This is a case of bilateral chronic conjunctivitis.

On Examination

The patient has normal vision. The conjunctiva is injected in both eyes. The upper eyelid was everted and showed multiple papillae (**Fig. 11**). Papillae are elevations in the conjunctiva with a central core of blood vessel usually found on the superior palpebral conjunctiva. They result from edema and polymorphonuclear cells infiltrating from the core vessel.⁹

Comments

Bilateral chronic papillary conjunctivitis usually indicates an allergic cause. In this patient's case, it is most likely atopic keratoconjunctivitis. It is important to make sure the patient is not a contact lens user because overusing contact lenses can present with a similar clinical picture. Atopic keratoconjunctivitis is different from vernal keratoconjunctivitis because the patients are usually older and the symptoms are independent of the seasons of the year (see **Fig. 12**).

Treatment

The patient is instructed to avoid known allergens and is educated on the benefits of frequent laundering of clothes and showering before bedtime. He was instructed to discontinue the use of over-the-counter vasoconstricting eye drops. These drops bring temporary relief, do not improve the inflammatory cause, and can be overused.

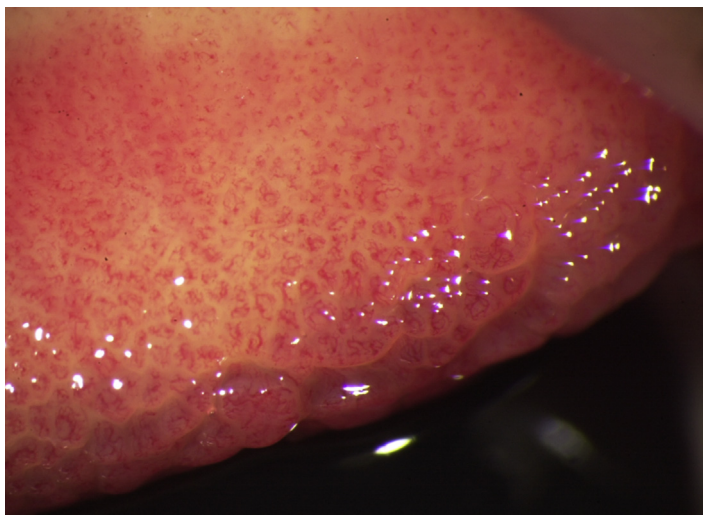


Fig. 11. Papillary changes on the upper palpebral conjunctiva. (Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.)

Initial treatment consists of a combination of preservative-free artificial tears, topical antihistamine, and topical mast cell stabilizers. Oral antihistamines can also be a part of the regimen. In some cases, a short course of topical steroids can be considered to improve symptoms. If topical steroids are indicated, the treatment should be initiated with the lowest potency and frequency. The patient should also be counseled on the potential side effects of topical steroids.⁹

Comments

A common comorbidity of chronic allergic conjunctivitis is dry eye syndrome. Oral antihistamines can exacerbate this condition. In some cases, long-term use of topical cyclosporine A provides antiinflammatory benefit for both dry eye and allergic components. In severe cases, it may be helpful to refer patients to an allergy specialist for allergen testing.

CASE STUDY 6

A 9-year-old African American boy presents with bilateral red eyes. His parents have noticed swelling and clear discharge from both eyes for about 1 month. The patient has been rubbing his eyes profusely and complaining of blurry vision. The patient also has a past medical history of atopic dermatitis and asthma.

Comments

The chronicity of the disease indicates that this is not an adenoviral infection; although common in this age group, these usually resolve in 10 days.

On Examination

The patient has decreased vision of 20/60 in the right eye and 20/30 in the left eye. The eyes are red with serous discharge and elevated limbal lesions (**Fig. 13**). With fluorescein staining, there appears to be a right corneal ulcer (**Fig. 14**). The patient was diagnosed with vernal keratoconjunctivitis and referred to an ophthalmologist urgently.

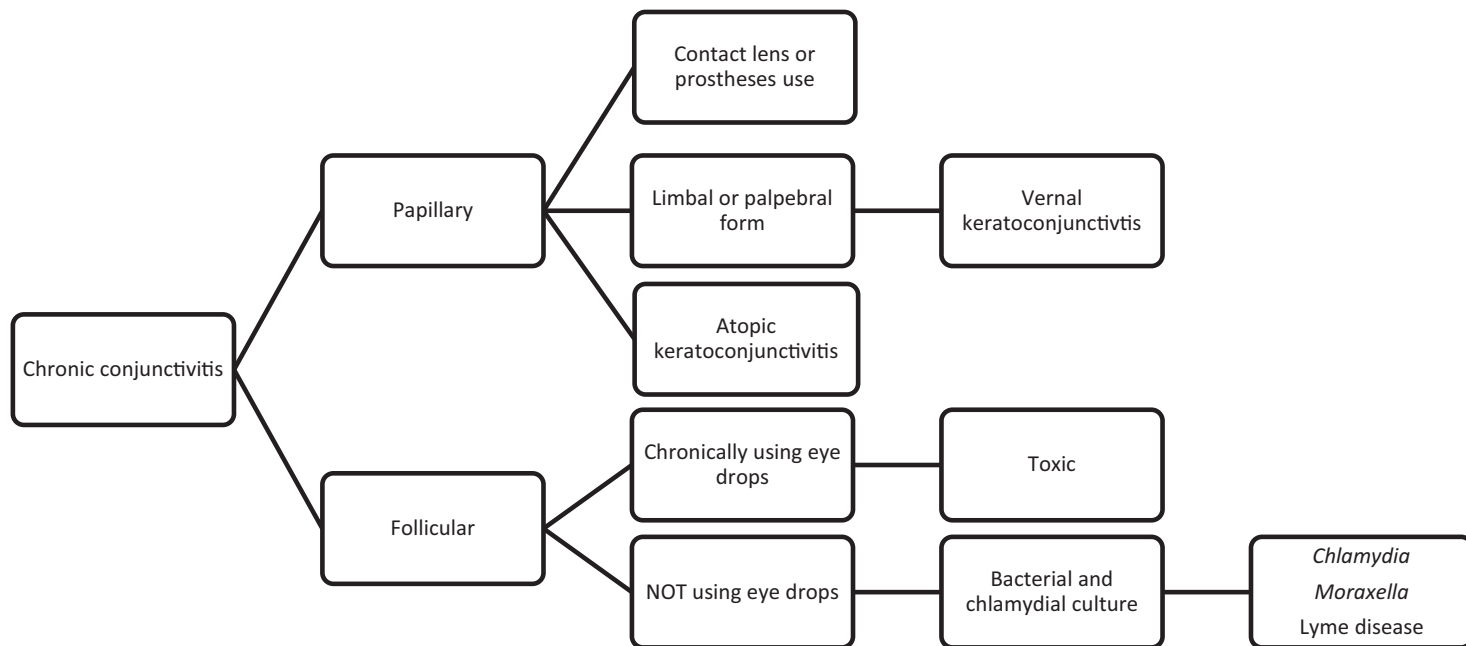


Fig. 12. Chronic conjunctivitis. (Adapted from Buttross M, Stern GA. Acute conjunctivitis. In: Margo C, Hamed LM, Mames RN, editors. Diagnostic problems in clinical ophthalmology. Philadelphia: WB Saunders; 1994.)

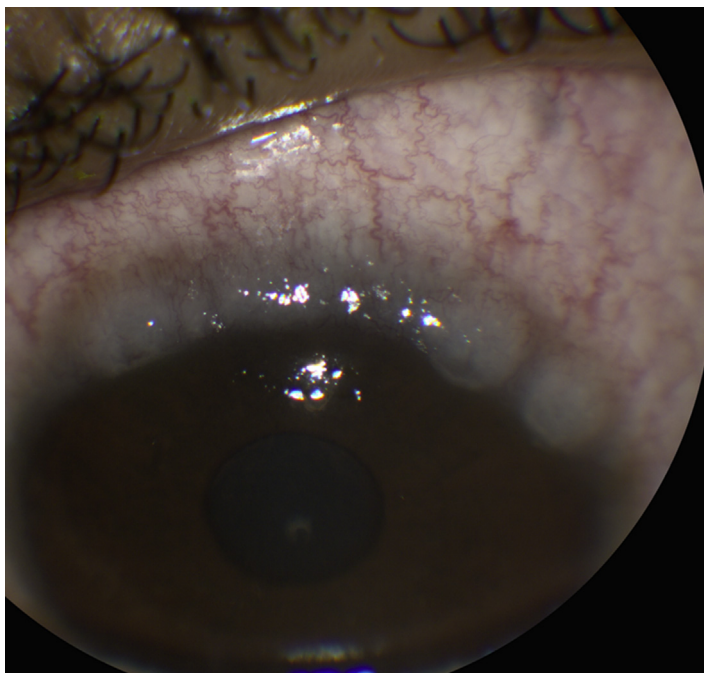


Fig. 13. Left eye limbal lesions in a patient with vernal conjunctivitis. (*Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.*)

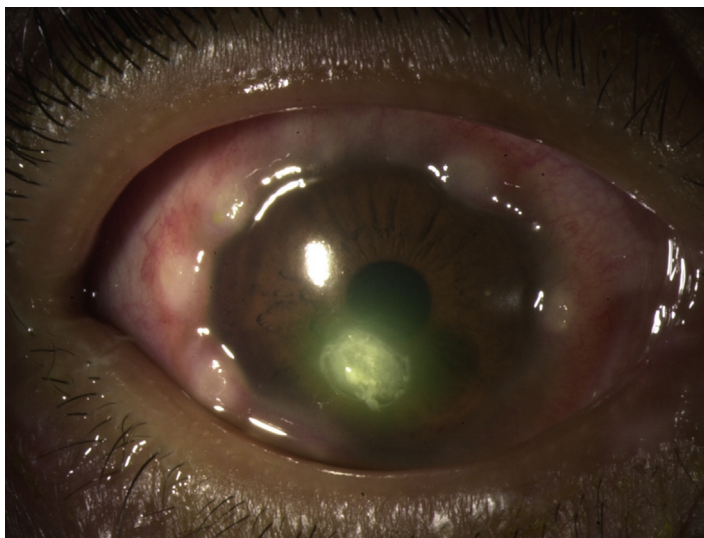


Fig. 14. Right eye limbal lesions and corneal ulcer. (*Courtesy of Emory Eye Center, Emory University School of Medicine, Atlanta, GA.*)

Comments

Vernal keratoconjunctivitis is usually found in young patients with presentation before the age of 10 years and usually resolution with the onset of puberty. There is a male predilection. Most patients have other systemic findings, such as asthma or eczema. The most common season of onset is spring, but symptoms can be present year-round. The finding of an ulcer on the peripheral cornea can be sight threatening.

Treatment

A patient with corneal findings should be referred to an ophthalmologist as soon as possible. Treatment involves avoidance of allergens, topical mast cell stabilizer drops, topical antihistamine drops, and oral antihistamine. In severe sight-threatening cases, topical and oral steroids can be used.

TREATMENT OF ALLERGIC CONJUNCTIVITIS

Treatment of allergic conjunctivitis begins with the avoidance of the causative allergen, if possible. Artificial tears serve to flush antigens and inflammatory mediators from the eyes as well as to provide a barrier. Pharmacologic agents used in the treatment of allergic conjunctivitis include antihistamines, multiple action antiallergic agents, and mast cell stabilizers. Antihistamines block histamine receptors, and relieve itching and redness, but only for a short time. However, these agents have no effect on other inflammatory mediators, such as prostaglandins and leukotrienes. Antihistamine decongestant combination agents may be more efficacious but are limited by short duration of action and need for dosing every 4 hours.¹¹ Mast cell stabilizers decrease degranulation of mast cells, which decreases histamine release and other chemotactic factors that are preformed or newly formed. These agents do not relieve existing symptoms. They can be used in advance of exposure to allergens to prevent mast cell degranulation, which may negatively affect medication adherence.

In general, mild symptoms should be treated with artificial tears and antihistamines. For symptoms that are more severe, persistent, or recurrent, these agents may be used in combination with decongestants and mast cell stabilizers.¹⁰ More recently, multiple action drugs have been developed. These drugs work as H1 receptor antagonists by decreasing mast cell degranulation and by suppressing activation and infiltration of eosinophils. Examples of these are olopatadine, ketotifen, and azelastine.¹² Nonsteroidal antiinflammatory drugs also alleviate symptoms by decreasing pain and inflammation but are not as efficacious for allergic conjunctivitis as the dual-action agents.¹² Nonsteroidal medications are not associated with increased intraocular pressure or cataract formation, so they are preferred to steroidal medications. Corticosteroids decrease the inflammatory response associated with allergic conjunctivitis but are associated with risk of cataract formation and increased intraocular pressure. Two newer agents, loteprednol etabonate and difluprednate, seem to have improved side effect profiles compared with the older agents.¹² Immunomodulators are another class of drug used to treat allergic eye disease. These drugs act both by immunosuppression and immunostimulation. Two examples of these are cyclosporine A and tacrolimus. Cyclosporine A acts by decreasing eosinophil infiltration by limiting the type IV allergic response, and tacrolimus acts by decreasing the action of T cells. Both have been found to be effective and, in general, have few side effects and are preferred to ocular steroids in the treatment of allergic eye disease.¹² Immunomodulators attached to a more hydrophilic medium such as nanoparticles and other medications that show novel antiinflammatory effects are currently in development.¹² In

general, steroids and immunomodulators should not be used in the primary care setting without ophthalmology consultation (Table 2).

Treatment of the severe forms of allergic conjunctival disease, such as AKC or VKC, usually involves the use of topical and oral antihistamines, ocular steroids, and cyclosporine. However, in cases of refractory disease, use of tacrolimus 0.1% has been shown to decrease total sign and symptom scores as well as giant papillae and corneal lesions.¹³

Subcutaneous immunotherapy (SCIT) and more recently sublingual immunotherapy (SLIT) are used to treat atopic disease such as conjunctivitis. The use of SLIT is currently considered off-label. A recent study concluded that the strength

Table 2 Ophthalmic agents for allergic conjunctivitis				
Drug	Trade Name	Age, Dose	Cost (\$)	Side Effects
H1-Antihistamines				
Emedastine difumarate	Emadine	≥3 y, 1 gtt qid	124	Headache 11%
Mast Cell Stabilizers				
Cromolyn	Opticrom and Crolom	≥2 y, 1–2 gtt qid	40	Burning, stinging, and itching <4%
Lodoxamide tromethamine	Alomide	≥2 y, 1–2 gtt qid	170	Burning, stinging, and itching 10%
Nedocromil	Alocril	≥3 y, 1–2 gtt bid	180	Headache, bitter taste, burning, and nasal congestion 10%
Pemirolast potassium	Alamast	≥3 y, 1–2 gtt qid	120	Burning, irritation, and nasal congestion <10%
H1-Antihistamines/Mast Cell Stabilizers Combination				
Alcaftadine	Lastacaft	≥3 y, 1–2 gtt q day	170	Burning, stinging, and itching <4%
Azelastine	Optivar	≥3 y, 1 gtt bid	105	Burning 10% Headache 15% Bitter taste 10%
Bepotastine	Bepreve	≥3 y, 1 gtt bid	300	Bitter taste 25% Headache, irritation, and nasopharyngitis 2%–5%
Epinastine	Elestat	≥3 y, 1 gtt bid	100	Cold symptoms 10%
Ketotifen	Zyrtec Eye and Claritin Eye	≥3 y, 1 gtt tid	20	Conjunctival injection, headache and rhinitis 10%–25%
Olopatadine	Pataday	≥3 y, 1–2 gtt q day	140	Headache 7%
Nonsteroidal Antiinflammatory Drugs				
Ketorolac tromethamine	Acular	≥12 y, 1 gtt qid	75	Burning, stinging, and itching 10%
Corticosteroid				
Loteprednol etabonate	Alrex	≥3 y, 1–2 gtt bid to qid	200	Headache, pharyngitis, and rhinitis 10%

Abbreviations: bid, two times a day; gtt, drops; q, every; qid, 4 times a day; tid, 3 times a day.

of evidence is low for SCIT and moderate for SLIT that either modality improved conjunctivitis symptoms.¹⁴ Of the 2 regimens used to give immunotherapy, perennial immunotherapy (PIT) was associated with decreased symptom medication scores compared with preseason immunotherapy (PSIT). In PIT, an induction phase is followed by a maintenance phase that is continued until the treatment time is completed, whereas in PSIT the induction doses are given in sequential years before the allergy season.¹⁵

TREATMENT OF BACTERIAL CONJUNCTIVITIS

The distinction between acute (mucopurulent) bacterial and viral conjunctivitis on clinical findings can be difficult and, given that there is widespread belief among primary care providers that bacterial conjunctivitis requires treatment with antibiotics, most patients who are diagnosed in primary care practices receive topical antibiotics.¹⁶ Previous data have suggested that acute bacterial conjunctivitis can be self-limited. Guidelines have been released in the United Kingdom to curb antibiotic use.¹⁷ However, even in countries where guidelines exist and are accessible, antibiotic use remains high.¹⁶ One potential treatment strategy is to identify those patients in whom antibiotic therapy might provide the most benefit. A patient data meta-analysis undertaken by Jefferis and colleagues¹⁷ showed that age less than 5 years is the most sensitive predictor of a positive bacterial culture. The most specific predictor was age less than 5 years with moderate symptoms and purulent discharge. A Cochrane Review, updated in 2012 on the use of antibiotics for bacterial conjunctivitis, confirms that treatment with topical antibiotics hastens early resolution and offers a modest benefit on late resolution.¹⁸ In addition, this review supports a delayed treatment strategy. Similar to strategies suggested for other infectious diseases, a delayed treatment strategy for acute bacterial conjunctivitis includes providing patient education on self-management techniques. Antibiotics are initiated if symptoms are not resolved in 3 days. This strategy was found by Everitt and colleagues¹⁹ to be similar to providing immediate antibiotics and better than withholding antibiotics. We suggest written patient education on self-management strategies with consideration of the seasonality of the different types of conjunctivitis and, in the appropriate clinical setting, the prescription of topical antibiotics with an option to delay treatment for 2 to 3 days. In 2006, a Cochrane Review stated that patients treated with placebo have low risk of adverse events.²⁰ In addition, initiation of antibiotics may allow an earlier return to school, because several state departments of public health have guidelines prohibiting return to school until patients are treated with antibiotics.²¹

Hyperacute (purulent) conjunctivitis is commonly caused by *N gonorrhoeae* and *Pseudomonas aeruginosa* and is less commonly triggered by the microorganisms that cause acute conjunctivitis. This form of conjunctivitis is usually an effect of auto-inoculation from infected genitalia and is most common during the warmer months.²²

C trachomatis can cause 3 distinct types of ocular infection: neonatal conjunctivitis, adult inclusion conjunctivitis, and trachoma. Neonatal chlamydial conjunctivitis is transmitted from an infected mother during delivery and presents within the neonatal period with typical symptoms of conjunctivitis. The treatment is oral erythromycin base or ethyl succinate for 14 days. Antibiotic prophylaxis given during birth does not prevent chlamydial disease but is intended to prevent gonococcal infections.²³ Adult inclusion conjunctivitis is a mucopurulent conjunctivitis that is associated with concomitant genital disease and treated with oral doxycycline or erythromycin.²³ Trachoma is a chronic keratoconjunctivitis found mostly in sub-Saharan Africa. It occurs from recurrent infections with *C trachomatis* in children and leads to scarring,

opacities, and blindness in adults. It is the most common cause of infectious blindness in the world.²⁴ The World Health Organization has established programs to eliminate trachoma through promotion of the SAFE strategy: surgery for trichiasis (eyelashes touching the eyeball), antibiotics, facial cleanliness, and environmental improvements. The antibiotics recommended are single doses of azithromycin or tetracycline ointment²⁴ (Table 3).

TREATMENT OF VIRAL CONJUNCTIVITIS

Viral conjunctivitis is an extremely common cause of conjunctivitis, with estimates as high as 80% of all causes of acute conjunctivitis.⁶ As many as 90% of these cases of viral conjunctivitis are thought to be caused by human adenovirus, which is known to cause 2 distinct syndromes: epidemic keratoconjunctivitis and pharyngoconjunctival fever.²⁵ Pharyngoconjunctival fever classically presents as conjunctivitis, sore throat, fever, and preauricular lymphadenopathy. Epidemic keratoconjunctivitis is more severe and, as the name implies, can produce outbreaks in closed communities. In addition, this form of adenoviral ocular infection is associated with either formation of pseudomembranes or subepithelial infiltrates as complications.²⁵ Patients who experience complications should be referred to an ophthalmologist. Treatment is supportive and includes using cold compresses, artificial tears, careful attention to hand washing, and prevention of spread. This treatment encompasses isolation of patients with symptoms and exclusion of health care providers from patient care duties for 2 weeks.²⁵ In severe cases associated with complications, steroids and tacrolimus can be considered for use by an ophthalmologist.

Table 3 Ophthalmic agents for bacterial conjunctivitis			
Drug	Trade Name	Dose	Cost (\$)
Fluoroquinolones			
Besifloxacin 0.6%	Besivance	1 gtt tid × 7 d	160
Ciprofloxacin 0.3%	Ciloxan	1–2 gtt qid × 7 d	50
Levofloxacin 1.5%	Iquix	1–2 gtt qid × 7 d	88
Ofloxacin 0.3%	Ocuflox	1–2 gtt qid × 7 d	40
Levofloxacin 0.5%	Quixin	1–2 gtt qid × 7 d	75
Moxifloxacin 0.5%	Vigamox	1 gtt tid × 7 d	155
Gatifloxacin 0.3%	Zymar	1 gtt tid × 7 d	82
Aminoglycosides			
Tobramycin 0.3%	Tobrex	1–2 gtt qid × 7 d	20
Gentamicin 0.3%	Genoptic	1–2 gtt qid × 7 d	23
Polymyxin B Combinations			
Polymyxin B/trimethoprim	Polytrim	1 gtt q 4 h × 7–10 d	25
Polymyxin B/bacitracin	Polysporin	13 mm q 4 h × 7–10 d	30
Polymyxin B/neomycin/gramicidin	Neosporin	1–2 gtt q 4 h × 7–10 d	70
Other Antibiotics			
Azithromycin 1%	AzaSite	1 gtt q 12 h × 2 d then 1 gtt q day × 5 d	140
Erythromycin 0.5%	Ilotycin	13 mm q 4 h to q 12 h × 7 d	35

Adapted from Morrow GL, Abbott RL. Conjunctivitis. *Am Fam Physician* 1998;57(4):735–46.

An uncommon cause of conjunctivitis is herpes virus. However, both herpes simplex and herpes zoster virus can cause conjunctivitis. Herpes simplex can present as a unilateral red eye with vesicular eyelid lesions. This condition is treated with oral and topical antivirals, such as acyclovir. Herpes zoster can involve the eye, and a potential for ocular involvement must be assumed in the presence of lesions at the tip of the nose (Hutchinson sign). These patients should be referred to an ophthalmologist for full ophthalmic evaluation and treatment with oral antivirals.⁶

Prevention

Avoidance of the viral and bacterial contamination and known allergens is the key to conjunctivitis prevention. Frequent hand hygiene helps decrease the chances of disease transmission. Patients with bacterial and viral conjunctivitis should be counseled to minimize contacts, and to avoid returning to work or school and sharing personal items. Avoidance of known allergens is the key to prevent recurrence for most cases of allergic conjunctivitis. Patients should be instructed to stay indoors during high pollen counts, keep windows closed, shower frequently, wash hair before sleep, use mattress and pillow allergen covers, launder clothes and sheets frequently, avoid carpets, avoid pets, and minimize contact lens use.

SUMMARY

Conjunctivitis is the most common cause of red eye in primary care. The 3 most common types of conjunctivitis are viral, allergic, and bacterial, and they can present in either acute or chronic forms. The age of the patient, time of year, and physical examination findings are paramount to distinguish the different types of conjunctivitis. Nonetheless, distinguishing between acute viral and bacterial conjunctivitis remains difficult. Cases of allergic conjunctivitis should initially be treated with artificial tears and antihistamine or mast cell stabilizing drops. Viral conjunctivitis should also be treated conservatively with modalities such as artificial tears and cold compresses unless herpes simplex or zoster is suspected. These patients should be treated with topical and oral antivirals respectively and referred for ophthalmic evaluation. Antibiotics have been shown to improve symptoms in cases of acute bacterial conjunctivitis and may hasten return to school in some states. Adverse outcomes in cases of acute bacterial conjunctivitis, which are not treated with antibiotics, are very rare, and using a delayed treatment strategy before use of antibiotics may prevent unnecessary medication. Patients with prolonged symptoms, poor response to initial management, or evidence of severe disease should be referred to ophthalmology for consultation.

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