

PSS NEWS

An On-Line Publication for COPE Continuing Education in Optometry

Dealing with Inflammation in Anterior Segment Disease 2.0 Hours - COPE 69976-AS

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Learning Objectives

After reading this issue, the participant should be able to:

- 1. List the diagnostic criteria for common anterior segment disorders.*
- 2. Describe the management of common anterior segment disorders.*
- 3. Understand the utilization of topical corticosteroids in the management of common anterior segment disorders.*

CASE STUDY:

JG was a 24-year old female patient who presented to the office with a complaint of red, irritated, itchy eyes which had been bothering her for 1 week. Her entering BCVA was 20/20 in each eye and pupils and EOMS were unaffected. Slit lamp examination revealed 2+ papillae OU with 1+injection and 2+chemosis of the conjunctiva OU. JG was given a prescription for Pataday (Alcon Laboratories) OU QAM and asked to return 2 weeks later for follow-up. At that visit, JG was “better, but not normal” Slit lamp examination demonstrated improvement in her clinical signs but not resolution. Consequently, she was told to continue the Pataday and was also given a prescription for Alrex OU BID and asked to return 1 week later. At that visit, she was normal except for 1- papillae OU for which she will continue to use Pataday prn.

DISCUSSION OF CASE:

This case is one of many anterior segment diseases that we encounter in which we must address a patient’s chief complaint and also

address their chief clinical signs. In this case, the Pataday was enough to control her symptoms related to the allergies, but the topical steroid was required to resolve the inflammation and to alleviate her complaints.

Blepharitis

The term *blepharitis* encompasses a variety of ocular manifestations dealing with redness and inflammation surrounding the lid margin and eyelashes. In many cases, chronic blepharitis is associated with poor hygiene or with conditions and occupations leading to dirty hands. In this bilateral condition, the most common symptoms are itching, burning, scratchiness, foreign-body sensation, excessive tearing, and crusty debris around the eyelashes that is worse in the morning. Slit lamp examination may reveal any combination of lid erythema, collarettes, trichiasis, plugged meibomian glands, conjunctival injection, and, occasionally, superficial punctate keratitis on the lower third of the cornea. Some patients may also demonstrate an associated conjunctivitis with

papillary hypertrophy of the palpebral conjunctiva.

Etiology

There are a variety of conditions which can cause blepharitis. For some patients, it may be caused by meibomianitis, seborrhea dermatitis, staphylococcal infection, or any combination of the three. Many patients exhibit excess lipid production by the meibomian glands or inflammation of the glands. This excess oil production around the lid margin promotes the formation of crusty debris in and around the meibomian glands. Patients also may have clogged meibomian orifices and disruption of the lipid layer of the tear film, which promotes dry eye. These oily deposits on the lid margin provide an ideal environment for staphylococci, and many patients with chronic blepharitis suffer from concurrent *Staphylococcus* infections. Bacterial exotoxins called lipases break down the cholesterol compounds normally present in the meibomian secretions, liberating fatty acids that are highly toxic to the corneal epithelium.

Treatment

The mainstay of long-term therapy for patients inflicted with blepharitis is improved lid hygiene. For patients with mild to early-moderate disease, this alone is sufficient to control the symptoms and prevent further complications. Scrubbing the eyelids with a mild, deodorant free soap or tearless shampoo often resolves or mitigates symptoms. For patients with clogged meibomian orifices, warm compresses alone may be sufficient to control symptoms. Moderate, severe, or chronic cases may require pharmaceutical intervention. The traditional choices for treating the underlying staphylococcal infection are sulfa drugs such as sulfacetamide. These agents work by competitive inhibition of para-amino benzoic acid, interfering with cellular processes of the bacteria. Other treatment options include the aminoglycosides (e.g., gentamicin, tobramycin), erythromycin, polymyxin B, and bacitracin. These

therapeutic agents are often prescribed for use two or four times a day as either ointment or eyedrops. Oral antibiotics such as tetracycline or doxycycline may be prescribed for more advanced cases which do not respond to topical therapy. If prescribing doxycycline, the typical dose is often 50 mg twice a day; if doing so, be sure to warn the patient about the increased sensitivity to sunlight.

In many cases of blepharitis, patients will experience episodes of flare ups in which the eyelids get red and inflamed and uncomfortable. During these times, many practitioners prescribe combinations of antibiotics and corticosteroids. Two of the most common options for these patients are Tobradex (tobramycin and dexamethasone; Alcon Laboratories) and Zylet (tobramycin and loteprednol; B&L pharmaceuticals). These antibiotic corticosteroid combinations feature tobramycin, which is effective against the staphylococcal aspect of blepharitis and a highly effective corticosteroid dexamethasone, to counter the associated inflammation.

Allergic Conjunctivitis

Allergic conjunctivitis is one of the most common conditions seen by optometrists. Unfortunately, most patients with ocular allergies self-diagnose and self-medicate their condition. This is especially true due to the increased number of OTC products on the market such as Zaditor, Claritin Eyes, etc. However, in the vast majority of patients, the prescription medications available for treatment of these conditions are far more effective than the available over-the-counter (OTC) agents.

Pathogenesis of Ocular Allergy

To understand how to best manage our patients, we should take the time to understand the pathophysiology of ocular allergies.

When most people think of ocular allergies, they think of seasonal allergic conjunctivitis. Patients who suffer from seasonal allergic conjunctivitis usually are affected during the

spring and early fall, but some patients have a variant of this condition, perennial allergic conjunctivitis, that affects them indoors and all year long.

The immunopathogenesis of seasonal allergic conjunctivitis and perennial allergic conjunctivitis is a type I hypersensitivity immunoglobulin E (IgE)-mediated reaction with the mast cell as the most important cellular component. Both the seasonal and the perennial forms progress in the same way, as follows:

- The patient experiences sensitization to environmental allergens. At this point, the patient does not develop any symptoms, but the IgE molecule binds to receptors on sensitized mast cells and basophils in a way that prepares them for future allergen exposure.
- When the patient then comes in contact with an allergen, within seconds the mast cells undergo degranulation, leading to the release of a wide assortment of inflammatory mediators. The most important of these is histamine, but prostaglandins, leukotrienes, and cytokines also are involved.
- The late phase (which only occurs in a small percentage of patients) begins hours after the initial activation and involves additional inflammatory cells. Eosinophils, neutrophils, basophils, and T lymphocytes infiltrate the conjunctival mucosa. Recurrent and prolonged symptoms result from a variety of mediators released by these additional inflammatory cells.

Diagnosis of allergic conjunctivitis is usually as easy as getting a history of patient complaints with slit lamp examination. Symptoms relating to allergic conjunctivitis usually include itching, burning, and tearing of the eyes with watery discharge. Slit-lamp examination often reveals conjunctival chemosis; red, edematous eyelids; and conjunctival papillae.

Treatment of Ocular Allergy

As with any ocular condition, proper management of ocular allergies is based on symptoms. The ideal treatment for allergic conjunctivitis would be to eliminate the potentially offending allergen, but usually this is not possible because many patients are allergic to outdoor pollen and ragweed, which are difficult to avoid. Common offending agents for patients with indoor allergies include dust mites, mold, and pets, and very few patients are able to eliminate all sources of indoor allergens.

Cold compresses and artificial tears can be used to relieve symptoms in mild cases. The tears dilute or wash away the antigens to decrease symptoms. In most cases, however, topical medications are required to relieve symptoms. OTC ocular allergy drugs such as Ophcon-A (Bausch & Lomb), Visine-A (Pfizer, Inc.), and Naphcon-A (Alcon Laboratories) contain an H1-receptor antihistamine (either antazoline or pheniramine) and a vasoconstrictor (either naphazoline or tetrahydrozoline). The antihistamine component competitively blocks the H1 receptors on the nociceptive type C nerves of the mucosal membranes, providing a significant decrease in ocular itching but having little effect on ocular redness or swelling. The vasoconstrictor component works on the conjunctival blood vessels to decrease redness.

The problems with OTC eyedrops are manifold:

- Many patients report that their eyes sting, burn, and tear when the drops are instilled;
- OTC eyedrops have a duration of action of 2 hours, but are recommended for use only 4 times a day, meaning that they provide only 8 hours of relief; and
- Chronic use of these drops may lead to tachyphylaxis, rebound conjunctivitis, and a permanent loss of ocular vessel tone.

Use of combination anti-allergy drugs can avoid these problems. Dual-acting compounds such as olopatadine HCl (Patanol, Pataday, Pazeo; Alcon Laboratories), epinastine (Elestat; Inspire Pharmaceuticals) and azelastine HCl (Optivar) combine the quick response of antihistamines with the prolonged action of mast cell stabilizers, providing a considerable advantage over mast cell stabilizers alone, which do not provide any immediate relief for allergy symptoms. They also are more effective than topical antihistamines, which have no impact on the delayed manifestations of ocular allergies. Two formulations of olopatadine - Patanol and Pataday- are now available over the counter. For some patients who do not obtain sufficient relief from these combination agents, the use of topical corticosteroids is appropriate. These agents act by blocking a vital enzyme in the arachidonic acid pathway of prostaglandin and leukotriene synthesis. The safety and efficacy profile of loteprednol, found in Alrex (Bausch & Lomb) and Lotemax (Bausch & Lomb) usually makes it the corticosteroid of choice for ocular allergy.

The optometrist may take one of two approaches when considering use of Alrex or Lotemax for treatment of allergic conjunctivitis. The first choice is to prescribe one of the dual-acting anti-allergy medications and see how well the patient responds. In my experience, approximately one third of patients will not obtain satisfactory relief solely from these agents and will need the corticosteroid to obtain control of the condition. The other alternative, especially when the patient has moderate or severe allergic conjunctivitis, is to prescribe the anti-allergy medication and the corticosteroid (e.g., Alrex) to be used simultaneously, then follow up with the patient after 7 to 10 days and taper the corticosteroid. The advantage of this approach is that nearly all patients obtain quick relief. In theory, nonsteroidal anti-inflammatory drugs (NSAIDs) such as ketorolac tromethamine (Acular; Syntex) and

diclofenac sodium (Voltaren; Novartis), which decrease the production of prostaglandins and thromboxane by inhibiting the cyclooxygenase pathway, could be prescribed. By inhibiting this pathway, NSAIDs help alleviate itchiness and conjunctival swelling, although they have minimal effect on ocular redness. The main drawback to the use of NSAIDs is that patients must use them four times a day, and many patients report significant burning and stinging upon instillation, so compliance becomes an issue.

Giant Papillary Conjunctivitis

GPC is seen often in patients who wear soft contact lenses. Its incidence has decreased significantly in the past decade with the emergence of disposable and planned-replacement contact lenses. However, abuse of these lenses in the form of improper cleaning and extended wear times has led to new cases of GPC, even in patients who use planned-replacement contact lenses. Many patients initially present with GPC months or even years after beginning contact lens wear. The characteristic papillae in GPC are observed on the superior tarsus during slit-lamp examination and measure 1 mm in diameter. Common symptoms include decreased lens tolerance, ocular itching after lens removal, and mucus discharge upon waking.

The allergic response in GPC is thought to be an overreaction of the body's immune system to the protein deposition on contact lenses or, rarely, to the lens material itself. Unlike a true allergic response, the GPC response has no seasonal variation and does not involve the IgE molecule. However, cytologic scrapings from the conjunctiva of patients with GPC exhibit an immunologic response containing lymphocytes, plasma cells, mast cells, eosinophils, and basophils, which suggests an antigen-antibody mechanism. Like the classic allergic response, GPC involves degranulation of mast cells, and subsequent increased capillary permeability produces lymphocyte circulation (i.e., T cells, eosinophils, and monocytes). The result is liberation of arachidonic acid, which is a catalyst for the

cyclooxygenase and lipoxygenase pathways. Like a standard allergic response, both of these pathways produce inflammatory mediators such as thromboxanes, leukotrienes, and prostaglandins leading to patient discomfort and formation of the characteristic papillae.

Treatment of Giant Papillary Conjunctivitis

Along with temporarily discontinuing contact lens wear, topical mast cell stabilizers comprise the treatment of choice for chronic GPC. These agents work by stabilizing the receptors on mast cell vesicles before they can degranulate, effectively halting the entire allergic response before it begins. Once the patient's symptoms subside, therapy may be needed for an additional 4 to 6 weeks or until the end of the episode. For some patients, contact lenses may need to be switched to daily disposable lenses. Many patients with GPC will require long-term therapy with anti-allergy drops even after they resume contact lens wear to keep the allergic response under control. Two excellent choices for mast cell stabilizers include cromolyn sodium and lodoxamide (Alomide; Alcon Laboratories). Both are safe agents and can be used in the same manner for a wide variety of allergic conditions, two to four times a day.

With the emergence of dual-acting antihistamine and mast cell stabilizing medications, many practitioners have opted to use products such as Patanol, Zaditor, or epinastine (Elestat; Allergan, Inc.). One advantage of these agents is that they feature twice-a-day dosing, which improves patient compliance.

In moderate or severe cases of GPC, topical corticosteroids may be prescribed in addition to the anti-allergy medications to help suppress the inflammatory response. Topical corticosteroids reduce capillary permeability; suppress lymphocyte circulation; inhibit the degranulation of mast cells; reduce the numbers of basophils and neutrophils; and decrease the production of prostaglandins,

thromboxanes, and leukotrienes. Site-specific corticosteroids such as loteprednol (e.g., Lotemax, Alrex) can be used in these patients. These agents are highly potent and highly effective, and they are associated with a decreased risk of intraocular pressure spikes. What I have found in my practice is that when I prescribe both Alrex and a combination antihistamine/mast cell stabilizer agent, patients recover more quickly, can return to contact lens wear sooner, and are much happier.

Dry Eye Syndrome Symptoms

Symptoms stemming from dry eye are one of the most common reasons patients visit an optometrist. As primary eyecare providers many of us have started treating this as a legitimate medical condition and have shifted management strategies away from mere lubricating drops to more-aggressive therapy in order to better serve our patients.

The most common patient symptoms are burning, stinging, foreign-body sensation, and epiphora. Pertinent risk factors for the condition include middle age in women, especially postmenopausal women; dry environments at work and at home (e.g., those that heavily rely on heating and air conditioning units); and extended periods spent working with computers or digital devices like smart phones and tablet computers. Other risk factors include use of systemic medications such as antihistamines, antidepressants, antipsychotics, hormone replacement therapy, and oral contraceptives. Refractive surgery such as LASIK, which severs corneal nerves, also may contribute to corneal surface dryness. Contact lens wear has been shown to decrease corneal sensation and disrupt the mucin layer of the tear film, thereby contributing to the incidence of dry eyes. The most commonly used tests in the clinical setting include the Schirmer test, phenol red thread test, fluorescein and rose Bengal staining, tear break-up time, tear meniscus height measures, and corneal staining with sodium fluorescein. However,

most of these tests lack good repeatability in clinical situations. In addition, most studies have shown a lack of correlation between test results and patient-reported symptoms. Other laboratory-based tests provide more-precise measures of dryness. These tests include freezing point depression osmometry, lactoferrin microassay, and fluorophotometry. However, in most cases, common clinically available tests are adequate to confirm your diagnosis.

Treatment

Even when OTC medications are prescribed, as they are for many patients, the patients should be reminded that dry eye can develop into a serious medical condition and that they should return for proper follow-up. Lubricating eye drops and artificial tears, which help to restore the compromised ocular surface to its naturally moist state, are appropriate for patients who have mild dryness symptoms. Preservative-free products that come in individual plastic vials and lubricant formulations that contain “disappearing” preservatives, such as Refresh Tears (Allergan, Inc.), Systane (Alcon Laboratories), Soothe (B&L Pharmaceuticals) and GenTeal (Novartis), are available. These products have demonstrated excellent efficacy with minimal effect on visual acuity. Although these are OTC products, giving samples to patients promotes good patient relations and allows the patient to “test drive” the product that has been recommended. In more difficult cases of dry eye, the patient can use lubricating drops during the day and add a gel or ointment at bedtime. These agents provide longer relief but may blur the patient’s vision, which is why bedtime dosing usually is the best option. However, be careful if the patient with dry eye has accompanying meibomian gland dysfunction; in such cases, the use of thick gels and ointments may exacerbate an already oily tear layer and lid margin.

If the patient cannot obtain adequate relief with topical agents, a short course of a mild corticosteroid such as loteprednol (e.g., Alrex,

Lotemax) to help manage the inflammatory nature of severe forms of chronic dry eyes may be prescribed. Both formulations of loteprednol do an excellent job of decreasing inflammation but are far less likely to cause increased intraocular pressure (IOP) than other corticosteroids such as prednisolone. Once the inflammatory process is under control, the corticosteroid dose is tapered, and a long-term management program is initiated. Many patients will then be able to manage their condition solely with lubrication, but others may need periodic short-term corticosteroid therapy two or three times a year. Consequently, it is wiser to use a site-specific corticosteroid such as loteprednol in such instances.

In lieu of or in addition to corticosteroid therapy, cyclosporine ophthalmic emulsion (Restasis 0.05%; Allergan, Inc.) can be prescribed. Restasis works by decreasing T-cell infiltration of the lacrimal gland, thus restoring its natural function. This agent has been shown to lead to statistically and clinically significant improvement as revealed by Schirmer wetting at 6 months, as well as to dramatic improvement in corneal superficial punctate keratitis as demonstrated by conjunctival rose Bengal staining. Since it can often take months for a patient to realize the full benefit from Restasis, I often prescribe both the topical corticosteroid and Restasis, tapering the corticosteroid after 3 to 4 months when the Restasis has taken effect. The typical dosing is twice a day. Restasis is an agent which used to be reserved for only severe cases of dry eyes, but I now find myself prescribing it earlier and earlier in the dry eye protocol. My rationale for this change in habit is simple: for many patients, dry eyes is a progressive disease. Once I have established that artificial tears alone will not control a patient’s condition, there is no reason to wait until advanced stages before I intervene more aggressively.

The long-chain omega -3 (eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA])

forms, which are largely derived from certain plant- and marine-based foods respectively have been utilized extensively in management of dry eye. Patients quite often like the “natural and nutritional aspects” of therapy of EPA and DHA when compared to synthetic chemicals. There are numerous randomized controlled trials (RCTs) that have compared the omega-3 supplementation to placebo. More recently the DREAM study showed that omega-3 fatty acid when compared to olive oil did not show any therapeutic advantage in dry eye therapy. Of the various published RCTs the DREAM study results were somewhat of an outlier. Although the results of the various RCTs have varied in its efficacy, overall beneficial effects have been seen. Both the Cochrane review and a largest meta-analysis report of seventeen published randomized controlled trials in the journal *Cornea* have shown that omega-3 supplementation may be an effective treatment for dry eye disease. Talk to your patients to ask if they have tried this in the past and to find out the amount of EPA and DHA present in their fish oil capsules.

Bacterial Conjunctivitis

Patients with bacterial conjunctival infections usually come into the office reporting that their eyes are red, irritated, and have mucopurulent discharge and that their eyelids are stuck shut when they awaken in the morning. This latter symptom alone is pathognomonic for this condition. Slit-lamp examination reveals injection of the bulbar conjunctiva and episcleral vessels and sometimes mild inflammation of the bulbar conjunctiva. The condition usually is bilateral, but an asymmetric presentation is not uncommon.

These infections usually develop in response to some breakdown in the normal defense mechanisms of the eye, which include bacteriostatic lysozymes and immunoglobulins in the tear film, the shearing force of the blink, the immune system in general, and nonpathogenic bacteria that

colonize the eye and compete against external organisms that try to enter. Common causes of breakdown include corneal abrasions and ocular hypoxia due to contact lens over wear. The organisms most commonly encountered in bacterial conjunctivitis are *Staphylococcus aureus*, *Haemophilus influenzae*, and *Streptococcus pneumoniae*.

Most bacterial infections are self-limited, and the signs and symptoms resolve gradually without treatment over the course of 2 to 4 weeks. Medical therapy provided by prescription antibiotic eyedrops will hasten recovery, however, improving patient comfort and decreasing the incidence of complications. Although serious sequelae are rare, bacterial conjunctivitis can lead to corneal ulcers, which can cause corneal scarring and permanent loss of visual acuity.

Ordering cultures and sensitivity tests would be the ideal way to identify the exact causative organism and choose the appropriate antibiotic therapy, but usually this is impractical and expensive, so it is not routine in private practice. Instead, most practitioners deduce the likely causative organism based on patient history and begin immediate treatment with a broad-spectrum antibiotic. Culturing usually is reserved for patients with atypical presentations or for the small percentage of patients who fail to respond to the initial therapy.

Antibiotic Therapy

The choice of antibiotic varies. Excellent initial broadspectrum antibiotics include polymyxin B sulfate and trimethoprim sulfate (Polytrim; Allergan, Inc.); gentamicin 0.3%; and tobramycin 0.3%. All of these provide good coverage of gram-positive and gram-negative organisms, though the aminoglycosides (gentamicin and tobramycin) have a little less activity against staphylococci. The fourth-generation fluoroquinolones gatifloxacin (Zymar; Allergan, Inc.) and moxifloxacin (Vigamox; Alcon Laboratories) have proven their clinical efficacy over the

years. Our newest allies in the fight against ocular infection include AzaSite (Inspire Pharmaceuticals) and Besivance (B&L Pharmaceuticals). The proper dosing for AzaSite is twice a day for 2 days, then once-a-day for 5 days. Thus only a total of 9 drops are needed for cases of bacterial conjunctivitis. Besivance is dosed TID for 7 days and offers the advantage of not having a systemic oral antibiotic counterpart which reduces the likelihood of resistance.

Antibiotic therapy should be aggressive, with administration ranging from four times a day to once every hour for the first few days and maintained for 5 to 10 days, depending on the severity of the condition. Once the infection has been eradicated, therapy should be stopped abruptly instead of tapered.

Corticosteroid–Antibiotic Therapy

Recently, we have seen a new trend in prescribing for bacterial conjunctivitis. Although antibiotics eradicate the bacteria, they do nothing to suppress the concurrent inflammation. Once the bacterial conjunctivitis has been resolved, it is necessary to decide whether to let the residual inflammation resolve on its own or to prescribe a topical NSAID or corticosteroid to reduce the inflammation more quickly and effectively.

If there is no significant corneal disruption and the possibility of herpes simplex infection has been excluded, some practitioners prescribe a corticosteroid–antibiotic combination as initial therapy for bacterial conjunctivitis. The two most popular choices are Tobradex (tobramycin 0.3%, dexamethasone 0.1%) and Zylet (tobramycin and loteprednol). Tobramycin is a broad-spectrum antibiotic that provides adequate coverage for 85% to

90% of the organisms that cause bacterial conjunctivitis. The corticosteroid in these agents helps to resolve the conjunctival inflammation and make the patient more comfortable.

Conclusion

As primary eyecare providers we have a multitude of power agents we may prescribe for our patients with anterior segment disease. These include antibiotics, antiviral, antiallergy, as well as topical steroids. Care and caution must be used when prescribing any of these drugs. Used judiciously, however, topical corticosteroids are a valuable weapon in our arsenal of agents for the treatment of anterior segment disease.

CONTINUING EDUCATION QUIZ

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Once you have registered for the course, you will be given an access code and go to www.flexiquiz.com where you will take the quiz. To earn credit, you must receive a grade of 70% or greater.

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Continuing Education Quiz

1. In some patients, blepharitis may be caused by
 - A. contact lens wear
 - B. eyeglass wear
 - C. Excessive lid hygiene
 - D. Staphylococcal infection
2. Poor hygiene and dirty hands often are associated with which of the following conditions?
 - A. dry eye syndrome
 - B. blepharitis
 - C. giant papillary conjunctivitis
 - D. open angle glaucoma
3. In blepharitis, lipases contribute to corneal punctate epitheliopathy by
 - A. breaking down the corneal collagen complexes
 - B. destroying the eyelashes
 - C. breaking down the cholesterol compounds within the meibomian secretions, which results in the release of free fatty acids
 - D. causing bacterial infections
4. The pathogenesis of seasonal allergic conjunctivitis involves which immunoglobulin?
 - A. B
 - B. C
 - C. D
 - D. E
5. Which one of the following types of hypersensitivity reaction is involved with seasonal allergic conjunctivitis?
 - A. Type I
 - B. Type II
 - C. Type III
 - D. Type IV
6. The late phase of ocular allergies involves
 - A. eosinophils

- B.** basophils
- C.** neutrophils
- D.** all of the above

7. The antihistamine components of medications such as Opcon-A, Visine-A, and Naphcon-A work on

- A.** nociceptive type C nerves of mucosal membranes
- B.** beta-1 selective receptors on the conjunctiva
- C.** beta-2 selective receptors on the conjunctiva
- D.** muscarinic receptors on the conjunctiva

8. Artificial tears help relieve patient symptoms in mild cases of allergic conjunctivitis by

- A.** directly competing with histamine sites
- B.** stopping the degranulation of mast cells
- C.** diluting or washing away the antigens
- D.** halting the production of prostaglandins

9. One of the disadvantages of using topical nonsteroidal anti-inflammatory drugs to manage ocular allergies is that they

- A.** require twice-a-day dosing
- B.** require four-times-a-day dosing
- C.** do not work for patients suffering from ocular allergies
- D.** are more expensive than prescription medications

10. Topical corticosteroids relieve symptoms relating to ocular allergies by which of the following mechanisms?

- A.** blocking a vital enzyme in the arachidonic acid pathway of prostaglandin and leukotriene synthesis
- B.** causing constriction of the blood vessels to combat ocular redness
- C.** increasing permeability of the conjunctiva tight junctions
- D.** none of the above; they are generally ineffective against ocular allergies

11. The papillae of giant papillary conjunctivitis are found

- A.** only in the inferior tarsus and measure 1 mm in diameter
- B.** in the superior tarsus and measure 1 mm in diameter
- C.** only in the inferior tarsus and measure at least 3 mm in diameter
- D.** in the superior tarsus and measure 3 mm in diameter

12. Mast cell stabilizers work to decrease symptoms of ocular allergies by

- A.** stimulating nociceptors on the nasal mucosa
- B.** competing with histamine for binding sites
- C.** causing the widespread destruction of mast cells
- D.** stopping the degranulation of mast cells

13. An advantage of using the dual-acting antihistamine/mast cell-stabilizing medications is that

- A.** they feature once-a-day dosing
- B.** they are powerful therapeutic agents that should be reserved for severe cases

- C. they feature twice-a-day dosing, which improves patient compliance
- D. they feature four-times-a-day dosing, which improves patient compliance

14. Of the following, the person most likely to suffer from dry eye syndrome is a

- A. 16-year-old boy with no ocular or medical problems
- B. 50-year-old postmenopausal woman with a history of LASIK who spends 8 hours a day at a computer screen
- C. 15-year-old girl with no ocular or medical problems
- D. 40-year-old man with a history of hypertension

15. The main problem with use of measures such as the Schirmer test, tear break-up time, and tear meniscus to assess dry eye syndrome is that they

- A. cause significant patient discomfort
- B. are highly accurate
- C. are not easy to perform in a clinical setting
- D. lack repeatability

16. The use of thick gels at bedtime for dry eye symptoms will exacerbate the condition for which of the following patients?

- A. One who has Sjögren syndrome
- B. Someone who also takes glaucoma medications
- C. A patient with accompanying meibomian gland dysfunction
- D. A patient with severe dry eyes

17. The eye's natural defense system to ward off infections does *not* include

- A. bacteriostatic lysozymes
- B. potent antibacterial compounds such as Tobramycin
- C. the shearing force of the blink
- D. immunoglobulins in the tear film

18. The pathognomonic symptom for bacterial conjunctivitis is

- A. eyelids that are matted shut upon wakening
- B. hyperemia of the conjunctiva
- C. itching
- D. a burning, stinging sensation

19. Which of the following organisms is/are most commonly encountered in bacterial conjunctivitis?

- A. *Staphylococcus aureus*
- B. *Haemophilus influenzae*
- C. *Streptococcus pneumoniae*
- D. *Streptococcus pyrogenes*

20. Culturing for bacterial conjunctivitis should be performed

- A. in every case
- B. in no case
- C. for hyperacute conditions or the small percentage of patients who fail to respond to therapy
- D. if the patient requests it