Primary Care

The Red Eye

Howard M. Leibowitz, M.D.

A RED eye is the most common ocular disorder that primary care physicians encounter. Most cases are relatively benign. Some, however, herald a vision-threatening or even life-threatening disorder. A detailed description of the full differential diagnosis of a red eye is available elsewhere.[1] This overview does not assume that the examiner has access to a slit lamp or has been trained to use it.

Subconjunctival Hemorrhage

A subconjunctival hemorrhage (Fig. 1) is often the cause of acute ocular redness. The diagnosis is based on simple observation of the characteristic features of such a hemorrhage: the redness, which is unilateral, is localized and sharply circumscribed, the underlying sclera is not visible, the adjacent conjunctiva is free of inflammation, and there is no discharge. There is also no pain, and vision is unaffected. Contributory factors include trauma (which may be so minor that the patient does not recall it), fragile conjunctival vessels, bleeding disorders, anticoagulation therapy, and hypertension. A subconjunctival hemorrhage sometimes results from prolonged coughing, vomiting, or a vigorous Valsalva maneuver. No specific treatment is necessary, but an evaluation for contributory factors should be undertaken. The patient should be reassured that the hemorrhage will clear gradually in two to three weeks. Failure to resolve suggests a less common cause (e.g., Kaposi's sarcoma) and warrants a referral to an ophthalmologist.

Conjunctivitis

Of the disorders that cause a red eye, conjunctivitis is the one that the primary care physician is most likely to encounter.[2-5] Conjunctivitis is characterized by dilatation of the superficial conjunctival blood vessels, resulting in hyperemia and edema of the conjunctiva, with discharge. A purulent discharge generally suggests a bacterial infection, but otherwise, the nature of the discharge is not clinically useful in determining the cause. Fluid may accumulate beneath the loosely attached bulbar conjunctiva, causing it to balloon away from the globe (a phenomenon known as chemosis). Patients with conjunctivitis do not usually report visual problems or ocular discomfort.

From the Department of Ophthalmology, Boston University School of Medicine, 715 Albany St., Suite L907, Boston, MA 02118, where reprint requests should be addressed to Dr. Leibowitz.

Viral Conjunctivitis

Conjunctivitis due to viral infection (Fig. 2), the leading cause of a red eye, is characterized by conjunctival hyperemia and edema, a watery discharge, and occasionally small hemorrhages. The disorder often affects one eye first and the other a few days later. The lids may be swollen. Conjunctivitis may develop during or after an upper respiratory tract infection or after exposure to a person with such an infection. A watery discharge may cause intermittent blurring, but vision is otherwise unaffected. Photophobia is uncommon. A palpable preauricular lymph node strongly supports the diagnosis but is not present in the majority of cases.

Viral conjunctivitis is usually self-limited, but there is evidence that treatment with a topical antibiotic shortens its course.[6] Broad-spectrum antibacterial eyedrops (e.g., a combination of trimethoprim [1 mg per milliliter] and polymyxin B [10,000 units per milliliter], one or two drops four times a day) are often prescribed. The ostensible reason for this treatment is to prevent bacterial superinfection, but the actual reason in many cases is that the patient will not accept a recommendation that no therapy be administered. Topical antiviral drugs are not administered.[7] The patient must be informed that viral conjunctivitis is highly contagious. In cases of adenoviral conjunctivitis (Fig. 3) and presumably other forms of viral conjunctivitis, replicating virus is present in 95 percent of patients 10 days after the appearance of symptoms but in only 5 percent on the 16th day.[8] The patient should be told not to share towels or other objects that might be contaminated and to avoid close contact with other persons, including indirect contact (e.g., in a swimming pool), for approximately two weeks. Similarly, the physician must be thorough with hand washing and decontamination of instruments.[9] If there is no improvement in 7 to 10 days, the patient should be referred to an ophthalmologist.

Bacterial Conjunctivitis

Bacterial conjunctivitis is caused by a wide range of gram-positive and gram-negative organisms, but the former predominate.[10] Acute bacterial conjunctivitis typically has an abrupt onset, develops in one eye initially but spreads to the opposite eye within 48 hours, and is manifested as tearing and ocular irritation at the outset. A mucopurulent or purulent discharge develops within one or two days, with a collection of debris at the base of the lashes and matting of the lids, particularly on awakening. Examination reveals diffuse hyperemia of the bulbar and tarsal conjunctiva, generally without marked lymphadenopathy, though in unusual cases (e.g., those associated with cat-scratch fever or tularemia), a preauricular or submandibular lymph node may be palpable.

In most cases of bacterial conjunctivitis, the diagnosis and the identification of the presumed patho-

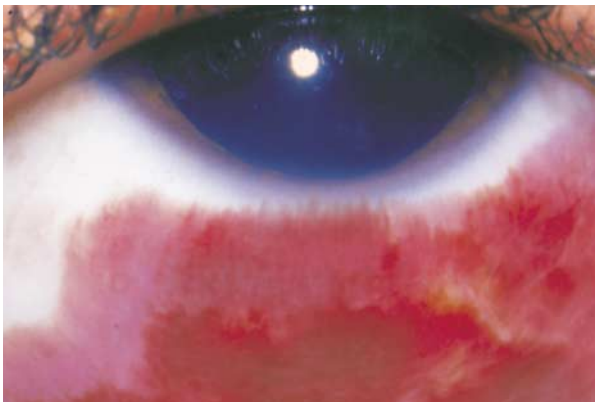

Figure 1. Subconjunctival Hemorrhage.
The sharply demarcated hemorrhage prevents the visualization of underlying structures. There is no inflammation in contiguous areas. This disorder does not affect vision and almost always clears spontaneously.

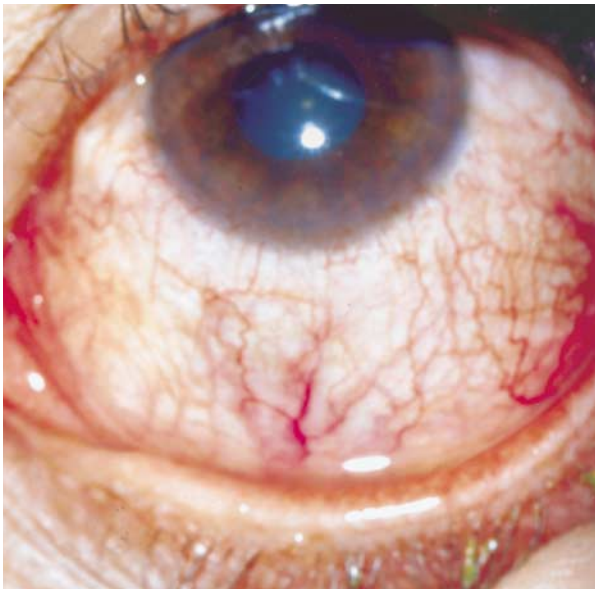

Figure 2. Presumed Viral Conjunctivitis.
In this case, no pathogen was identified by laboratory studies, but a history of a recent upper respiratory tract infection and the absence of a purulent exudate supported the diagnosis. Viral conjunctivitis is usually self-limited.

gen are based on clinical evaluation. Laboratory studies are performed to identify the organism and determine its sensitivity to antibiotic agents only in severe cases and those that are unresponsive to initial treatment. Treatment consists of a broad-spectrum topical antibiotic administered four times daily. This empirical approach is highly effective, and adverse consequences are infrequent.[6,10-12] My preference is a 7-to-10-day course of gentamicin (0.3 percent) or tobramycin (0.3 percent) eyedrops. Though also highly effective and still widely used in the United Kingdom,[5,13-15] topical chloramphenicol (0.5 percent) has been associated with a rare but devastating aplastic anemia[16-18] and is not used routinely in the United States. The topical fluoroquinolones ciprofloxacin (0.3 percent) and ofloxacin (0.3 percent) are also highly effective[10-12] but should be reserved for severe infections. Bacitracin (500 units per gram) and erythromycin (0.5 percent), which are effective against gram-positive bacteria, are available only in the form of ointments that are difficult to instill and that blur vision. Oral antibiotics alone may be insufficient to treat bacterial conjunctivitis in adults.[19] If the disorder does not improve in one week, the patient should be referred to an ophthalmologist.

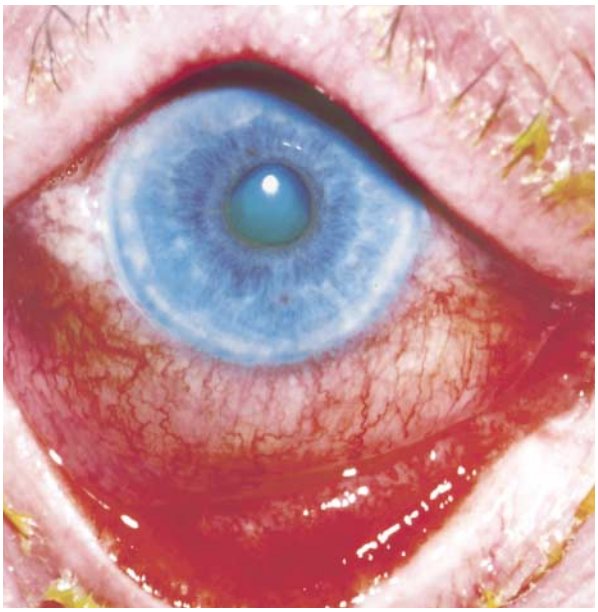

Figure 3. Severe Adenoviral Conjunctivitis.
This case occurred during an outbreak of epidemic keratoconjunctivitis. The disorder is highly contagious, with replicating virus present in most infected persons 10 days after the development of symptoms and signs.

Hyperacute bacterial conjunctivitis (Fig. 4), characterized by an abrupt onset, a copious purulent discharge, and rapid progression, is usually associated with a gonococcal infection in a sexually active adolescent or adult. The conjunctiva becomes bright red and chemotic, and an inflammatory membrane (consisting predominantly of leukocytes and fibrin) may develop on the tarsal conjunctival surface. The abundant discharge usually reaccumulates rapidly after it

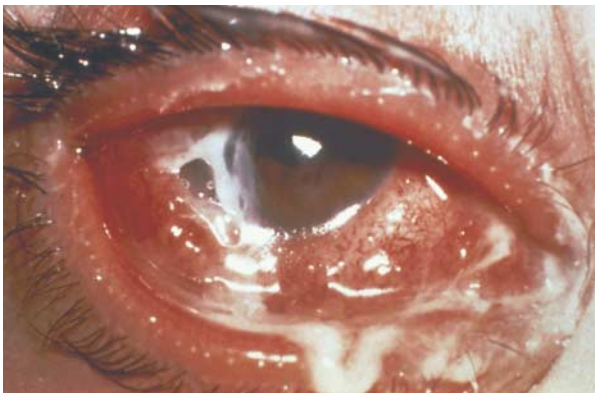

Figure 4. Hyperacute Gonococcal Conjunctivitis.

This virulent infection can rapidly cause severe ocular injury. Aggressive treatment (including systemic antibiotics) must be instituted immediately. Reprinted from Albert and Jakobiec[20] with the permission of the publisher.

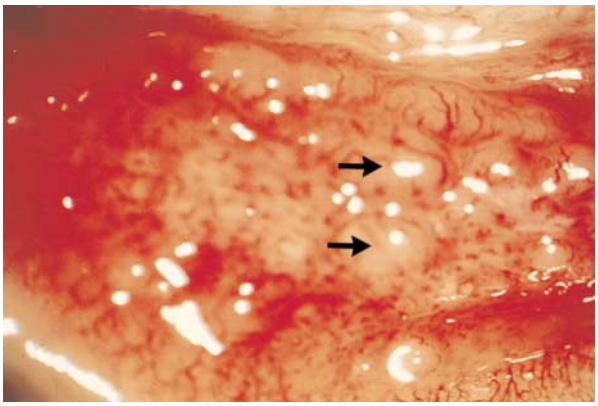

Figure 5. Inclusion Conjunctivitis.

Prominent follicles (arrows) are present in the inferior fornix. Inclusion conjunctivitis is a sexually transmitted disease that requires systemic antibiotic therapy.

has been wiped away. Preauricular adenopathy is often present, and there is marked swelling of the lids, with aching and tenderness on palpation. Because of the abrupt onset of this disorder and the severity of the signs and symptoms, the patient often seeks care before the infection affects both eyes.

Hyperacute conjunctivitis requires aggressive treatment; if left untreated, the infection may involve the cornea, rapidly causing peripheral ulceration and ultimately leading to perforation.[21] Immediate referral to an ophthalmologist is indicated. Treatment with topical antibiotics (bacitracin, erythromycin, or ciprofloxacin) plus a full systemic regimen with an antibiotic against gonorrhea should be instituted immediately. Treatment of gonococcal conjunctivitis with a single 1-g dose of intramuscular ceftriaxone has been effective.[22] Because gonococcal conjunctivitis is a venereal disorder, the patient should be asked about symptoms of urethritis and vaginitis (if the patient is female) and about sexual contact with persons who might be infected.

Chlamydial Conjunctivitis

Chlamydial infection causes trachoma and the adult and neonatal forms of inclusion conjunctivitis. Trachoma that results in blindness, one of the most common diseases in humans, is seen only sporadically in the United States. Fortunately, neither adult nor neonatal inclusion conjunctivitis causes loss of vision, unlike endemic trachoma.

Inclusion conjunctivitis in adults and adolescents (Fig. 5) is a sexually transmitted disease that is common in urban areas. The disorder is almost always acquired through exposure to infected genital tract secretions, transmitted from hand to eye or from genitalia to eye. The associated genital tract infection is usually asymptomatic, but male patients may have symptomatic urethritis, and female patients may have chronic vaginal discharge.[23]

Symptoms and signs of inclusion conjunctivitis may be acute or subacute in onset and are often unilateral initially. The patient generally has a red, mildly irritated eye, with a mucopurulent or purulent discharge and lids that are stuck together on awakening. A preauricular node is frequently present on the affected side. There is generally no history of fever or upper respiratory tract infection. A follicular response, most marked in the inferior conjunctival fornix, may be apparent with the use of a magnifying device. Scarring of the conjunctiva, which is characteristic of trachoma, is rarely present in adolescents or adults with inclusion conjunctivitis.[23]

Oral treatment with tetracycline or erythromycin (250 mg four times a day) or doxycycline (100 mg twice a day) for 14 days is required to eradicate inclusion conjunctivitis in adults and adolescents.[23] Cure rates exceed 95 percent.[24] Topical therapy may suppress the ocular symptoms temporarily but does not affect the genital reservoir of the disease and is therefore not effective when used alone. Treatment of sexual partners helps prevent reinfection. Since tetracyclines cross the placenta and may be deposited in the deciduous teeth of offspring, they should not be given to pregnant women.[25] Tetracyclines can also cause lifelong discoloration of the permanent teeth if given to patients who are less than eight years old.[26] Chlamydial infection is managed with erythromycin in such patients.

Allergic Conjunctivitis

Seasonal allergic conjunctivitis, a type I, IgE-mediated hypersensitivity to pollen, animal dander, or

dust, is the most common form of ocular allergy and is often encountered in patients with atopic disease.[27] Perennial allergic conjunctivitis is similar, but the symptoms are less severe. Conjunctivitis medicamentosa, a contact allergy, is characterized by a red eye with eyelid edema, erythema, and scaling in a patient using a topical ophthalmic medication. The hallmark of allergic conjunctivitis is itching, often accompanied by tearing and nasal congestion. There is bilateral dilatation of the conjunctival blood vessels, with varying degrees of chemosis and a mucoid discharge.

Removing the offending allergen when possible or diluting it by instilling artificial tears is a simple, effective treatment. Conjunctivitis medicamentosa can be treated simply by discontinuing the medication that causes the allergic reaction. Topical and systemic antihistamines relieve itching; my choice of a topical agent is levocabastine hydrochloride (0.05 percent four times a day). Over-the-counter eyedrops that contain an antihistamine (antazoline or pheniramine) combined with a vasoconstrictor (naphazoline hydrochloride) can be effective in mild cases. These preparations relieve itching and whiten the eye by constricting the conjunctival blood vessels, but they can cause a reactive hyperemia with prolonged use.[28] Although topical mast-cell stabilizers (cromolyn sodium [4 percent] and lodoxamide tromethamine [0.1 percent]) can be used, the clinical response is not immediate. These drugs must be given for approximately two weeks to prevent the release of histamine and other chemotactic factors. Treatment with topical nonsteroidal antiinflammatory drugs has variable results.

BLEPHARITIS AND OTHER EYELID ABNORMALITIES

Blepharitis, an acute or chronic inflammation of the eyelid often associated with conjunctival inflammation, is caused by a variety of infectious agents, allergic disorders, and dermatologic diseases. When bacteria, particularly staphylococci, colonize the eyelash follicles and the meibomian glands, excess secretion of abnormal lipids occurs.[29,30] Ocular irritation ensues, with sensation of the presence of a foreign body, accompanied by erythema and edema of the eyelid margins, misdirection and loss of eyelashes, conjunctival hyperemia, and instability of the preocular tear film.[31,32] The resultant drying of the corneal surfaces exacerbates the conjunctival hyperemia and causes microscopic erosions of the corneal epithelium, mild visual distortion, and photophobia. Since most cases are chronic and require long-term therapy, they are best managed by an ophthalmologist.

Abnormal apposition of the eyelid margins to the globe can cause a red eye. Entropion (inward rotation of the margin of the eyelid) and trichiasis (misdirection of the lashes toward the cornea) can irritate and abrade the ocular surface. Ectropion (outward rotation of the margin of the eyelid) can cause anomalous spreading of tears over the ocular surface; exposure keratopathy (excess evaporation of tears and drying of the corneal surface) may ensue if the eyelid abnormality is severe. Entropion and ectropion can usually be diagnosed by inspecting the eyelid. Since definitive treatment frequently requires surgical intervention, patients with these disorders should be referred to an ophthalmologist.

EPISCLERITIS

The episclera lies beneath the conjunctiva and over the sclera. Episcleritis (Fig. 6), which occurs much less often than conjunctivitis, is a self-limited, recurrent, presumably autoimmune inflammation of the episcleral vessels. It is characterized by the rapid onset of redness, a dull ache, and tenderness on palpation. Vision is unaffected. Discharge, if present, is watery. There are focal areas of redness present within which white sclera may be observed between radially coursing, dilated episcleral vessels. An oral nonsteroidal antiinflammatory drug (e.g., aspirin) may relieve the symptoms, but reassurance that the condition is self-limited and will clear spontaneously is often all that is required. Persistent or recurrent disease warrants a referral to an ophthalmologist.

SCLERITIS

Scleritis can impair vision and may be associated with a life-threatening vascular or connective-tissue disease (e.g., rheumatoid arthritis).[33] Fortunately, scleritis is much less common than conjunctivitis or episcleritis. The redness may be focal or diffuse, and the underlying sclera is pink. Typically, there is moderate-to-severe, deep ocular pain and tenderness on palpation. The diagnosis of scleritis calls for a prompt referral to an ophthalmologist; an oral nonsteroidal antiinflammatory drug may help relieve symptoms in the interim. Treatment often requires systemic corticosteroids, antimetabolites, or both and should be managed concurrently by the ophthalmologist and the primary care physician.

PTERYGIUM

A pterygium (Fig. 7) is a benign, degenerative conjunctival lesion often seen in hot, dusty climates, particularly among persons who spend large amounts of time outdoors and are exposed to ultraviolet light (e.g., fishermen and farmers). A pterygium usually develops over a period of years and is asymptomatic, but the disorder may be manifested as acute redness of the eye if the lesion becomes inflamed and irritable. The redness is confined largely to a raised, yellowish, fleshy lesion that is usually located on the nasal side of the bulbar conjunctiva. The lesion may extend into the peripheral cornea, but unless the paracentral cornea is involved, vision is unaffected. Lubrication with artificial tears often provides adequate relief. A referral to an ophthalmologist is indicated if

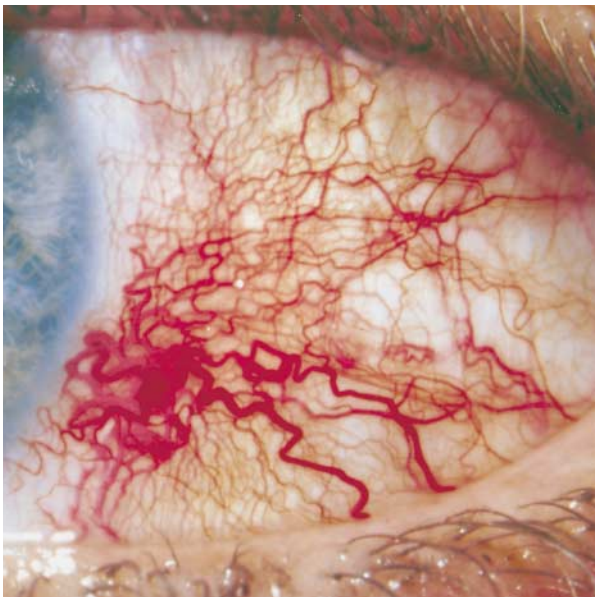

Figure 6. Episcleritis.
There are engorged, radially oriented vessels and a nodule adjacent to the limbus. In this case, the opposite (nasal) sector of the conjunctiva and episclera was not inflamed. This presumably autoimmune disorder is generally self-limited.

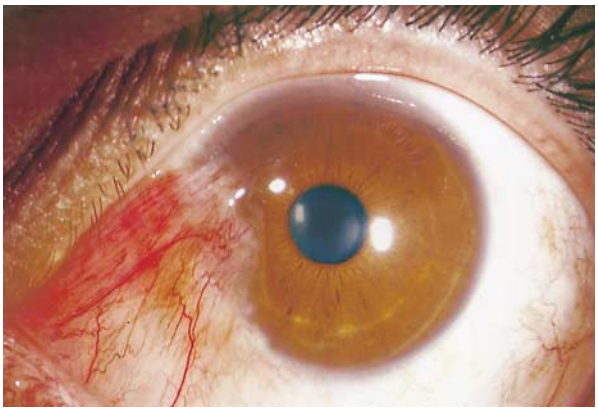

Figure 7. Pterygium.
Hyperemia is confined to the elevated, nasal lesion. This degenerative condition is most common in persons who spend large amounts of time outdoors and are exposed to ultraviolet light.

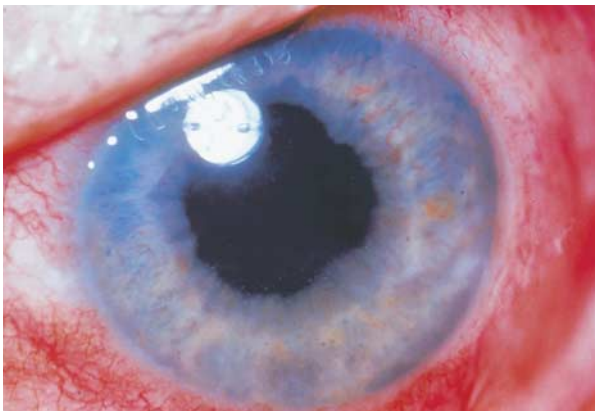

Figure 8. Angle-Closure Glaucoma.
The pupil is moderately dilated and unreactive to light. Corneal edema causes the iris markings to appear less sharp than those of the unaffected eye. Prompt, aggressive treatment of this disorder is necessary to prevent optic atrophy.

the lesion has recently become larger or has invaded the cornea.

ACUTE ANGLE-CLOSURE GLAUCOMA

A narrow anterior-chamber angle may occur in persons with hyperopia (farsightedness), because the globe has a shortened axial length, and in older persons, because the increasing anterior–posterior dimension of the crystalline lens may push the iris forward.[34,35] Signs and symptoms of acute angle-closure glaucoma (Fig. 8) often occur in the evening, when reduced ambient illumination provokes mydriasis, causing the accordion-like folds of the peripheral iris to block the narrow angle and prevent the outflow of aqueous humor. The result is a rapid, pronounced elevation of intraocular pressure, with redness of the eye and moderate-to-severe pain. Gentle palpation through closed lids often confirms that the involved eye is much harder than the uninvolved eye. The redness is most pronounced in the area adjacent to the limbus (circumcorneal injection). The source of the pain may not be evident. There have been cases in which nausea and vomiting, associated with headache, were so severe and persistent that exploratory laparotomy was performed before the importance of the red eye was recognized.[36]

In most instances, acute angle-closure glaucoma is unilateral. The pupil of the involved eye is moderately dilated (i.e., to a diameter of 4 to 6 mm) and unreactive to light; the other pupil is normal. Corneal haziness, due to edema, causes the iris markings to appear less sharp than those of the uninvolved eye, blurs vision, and accounts for the classic symptom of seeing haloes around lights. This condition constitutes an ocular emergency. Optic-nerve atrophy and irreversible loss of vision can occur within hours after the onset of the disorder. A prompt transfer of care to an ophthalmologist is essential.

ACUTE ANTERIOR UVEITIS

Inflammation of the iris and ciliary body, the anterior portion of the uveal tract, usually occurs in

young or middle-aged persons. The hallmark of acute anterior uveitis, also called iritis or iridocyclitis (Fig. 9), is the presence of inflammatory cells and proteinaceous flare in the anterior chamber of one eye. These features usually cannot be detected without a slit lamp. If the inflammation is severe, however, leukocytes in the anterior chamber settle and form a hypopyon, a white or yellowish white, flat-topped accumulation of purulent material that is generally visible without magnification. Symptoms include pain (often characterized as an ache), photophobia, and blurred vision in the involved eye. Typically, hyperemia is most pronounced in the area adjacent to the limbus (circumcorneal injection). Discharge, if present, is minimal and watery. Whereas the pupil is semidilated in angle-closure glaucoma, in anterior uveitis the pupil is constricted and is smaller than that of the unaffected eye; it may be irregular and, at best, is sluggishly reactive to light. Anterior uveitis can cause glaucoma, pupillary abnormalities, cataract formation, and macular dysfunction. Since the disorder can impair vision, an immediate referral to an ophthalmologist is warranted.

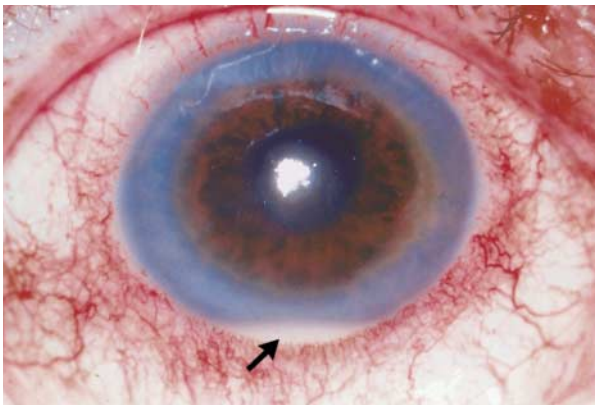

Figure 9. Acute Anterior Uveitis.

The pupil is constricted, irregular, and poorly reactive to light. Conjunctival hyperemia is most pronounced adjacent to the limbus. A hypopyon is present (arrow). This disorder can cause loss of vision and warrants immediate referral to an ophthalmologist.

SUPERFICIAL KERATITIS

A wide variety of factors, including dry eyes, topical medications, viral conjunctivitis, exposure to ultraviolet light, use of contact lenses, blepharitis, and eyelid abnormalities, can cause superficial keratitis. This disorder is characterized by an inflammation of the corneal epithelium and superficial stroma, with conjunctival hyperemia. Multiple punctate lesions — some consisting of nonopaque, microscopic epithelial erosions that stain strongly with fluorescein dye and others consisting of tiny gray spots — may impart a hazy appearance to the cornea, impair vision, and cause discomfort. The specific diagnosis and management of this disorder require a slit lamp and are best left to the ophthalmologist.

RECOMMENDATIONS

In most cases, the primary care physician can correctly diagnose acute redness of the eye (Table 1)

Table 1. Diagnostic Characteristics of Selected Disorders That Cause a Red Eye.

Characteristic or Site	Conjunctivitis	Episcleritis	Scleritis	Angle-Closure Glaucoma	Acute Anterior Uveitis	Superficial Keratitis
Hyperemia	Diffuse, more prominent toward fornices	Focal	Focal or diffuse	Diffuse; most prominent adjacent to limbus	Diffuse; most prominent adjacent to limbus	Diffuse
Discharge	Yes	No	No	No	Minimal, if present	Yes (if infectious cause)
Pupil	Not affected	Not affected	Constricted if secondary uveitis present, otherwise not affected	Moderately dilated; unreactive to light	Constricted; poor response to light	Constricted if secondary uveitis present, otherwise not affected
Ocular pain	Essentially none	Mild to moderate	Moderate to severe	Moderate to severe (often with headache and vomiting)	Moderate	Moderate to severe
Vision	Generally not affected	Not affected	May be reduced	Severely reduced	Mildly to moderately reduced	Moderately to severely reduced
Cornea	Clear	Clear	Occasional peripheral opacity, otherwise clear	Hazy	May be hazy (not as prominently as in angle-closure glaucoma)	Hazy

and provide appropriate treatment or refer the patient to an ophthalmologist. If the condition is chronic or if it recurs frequently, however, the probability that the primary care physician can handle the problem decreases substantially, and a referral to an ophthalmologist for diagnosis and treatment should be considered.

The following guidelines are invaluable in diagnosing and managing conditions that cause a red eye. A unilateral red eye associated with vomiting should be considered acute angle-closure glaucoma until proved otherwise. Viral conjunctivitis can be highly contagious, and physicians must take great care not to transmit the disease to themselves or to other patients. A topical corticosteroid or a topical anesthetic should never be prescribed. Corneal staining with fluorescein and any alteration of corneal transparency merit ophthalmologic consultation.

Severe ocular pain or a visual deficit in association with a red eye calls for immediate intervention by an ophthalmologist, as does a corneal infiltrate or a hypopyon. In such cases, the primary care physician should not simply recommend that the patient see an ophthalmologist but should instead transfer the patient to an ophthalmologist's care immediately.

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