REFINEMENTS

Clinical Education Modules for Today's Ophthalmic Team

Volume II / Number 1 (Section 2 of 2) January 1998

Recognition and Triage of Ocular Emergencies

Lucie S. Elfervig, DNS
John L. Elfervig, MD

American Academy of Ophthalmology

Recognition and Triage of Ocular Emergencies

REFINEMENTS: Clinical Education for Today's Ophthalmic Team is published quarterly by the American Academy of Ophthalmology, 655 Beach St., San Francisco, CA 94109-1336. Yearly subscriptions are $70. Application to mail at Periodicals Postage rates is pending at San Francisco, CA, and additional mailing offices. POSTMASTER: Send address changes to *REFINEMENTS: Clinical Education for Today's Ophthalmic Team*, P.O. Box 7424, San Francisco, CA 94120-7424

Substantive editorial revisions to this module may have been made based on reviewer recommendations.

This module has been awarded 1 continuing education credit by JCAHPO.

Because diagnostic, therapeutic, and practice recommendations may have changed since the publication of this module, because such recommendations cannot be considered absolute or universal in their application, and because the publication process contains the potential for error, the Academy strongly advises that the recommendations in this module be verified, prior to use, with information included in the manufacturersí package inserts or provided by an independent source and be considered in light of a particular patientís clinical condition and history. Caution is especially urged when using new or infrequently used drugs. Including all indications, contraindications, side effects, and alternative agents for each drug or treatment is beyond the scope of this module.

The Academy disclaims responsibility and liability for any and all adverse medical or legal effects, including personal, bodily, property, or business injury, and for damages or loss of any kind whatsoever, resulting directly or indirectly, whether from negligence or otherwise, from the use of the recommendations or other information in this module, from any undetected printing errors or recommendation errors, or from textual misunderstandings by the reader. The ultimate arbiter of any diagnostic or therapeutic decision remains the individual physicianís judgment.

Reference to certain drugs, instruments, and other products in this publication is made for illustrative purposes only and is not intended to constitute an endorsement of such drugs, instruments, and other products. Any significant financial interest or other relationship any author of this publication may have with the manufacturer(s) of any commercial products(s) discussed in sections to which he or she contributed is disclosed in text, after the authorís affiliations.

Each author states that he or she has no significant financial interest or other relationship with the manufacturer of any commercial product discussed in this module or with the manufacturer of any competing commercial product.

Cover photo (top left): Courtesy W. K. Kellogg Eye Center, University of Michigan

Introduction

Over 100,000 people in the United States each year suffer eye trauma that results in vision loss, and over 2 million people sustain some type of eye injury. All health professionals who see eye emergencies should have basic ocular knowledge and should recognize the signs and symptoms of common eye problems. Prompt triage procedures and appropriate treatment can help determine the visual outcome when such problems occur. Immediate and copious irrigation in a chemical injury, for example, may make the difference as to whether a patient ever sees again.

In a true eye emergency, time is crucial. When assessing ocular emergencies and injuries, it is important to remember that providing timely and appropriate triage, treatment, and referral can improve the final visual results. The goal of this module is to provide ophthalmic medical personnel with the appropriate steps to take when faced with an ocular emergency, as well as to provide general information on such emergencies, including the specific therapeutic decisions ophthalmologists must make in treating emergencies.

Objectives

Upon completion of this module, the reader should be able to:

1. Demonstrate basic knowledge of true ocular emergencies (where minutes count), urgent ocular emergencies (where hours count), as well as other ocular emergencies and injuries.
2. Take a comprehensive medical and ocular history.
3. Identify signs and symptoms to determine the degree of ocular injury.
4. Perform a gross eye examination through observation, penlight evaluation, slit-lamp evaluation, and direct ophthalmoscopic examination.
5. Perform appropriate steps to stabilize the patient's involved eye in an ocular emergency and/or injury.
6. Evaluate the severity of ocular involvement, and provide appropriate triage and referral.
7. Describe possible ocular treatment options.

The History

When an eye trauma occurs, an accurate and complete history—including a general medical and ocular history and a record of the signs and symptoms of the problem—is extremely important in evaluating the full extent of the ocular condition. The time allowed in taking a comprehensive history is determined by the severity of the ocular trauma.

General

A general medical history provides information on current medical health status and management, past medical and surgical history, family medical and surgical history, social history, and allergies or adverse reactions to any type of treatment. At this stage, questions would include:

- Do you have any allergies or have you had adverse reactions to any medications, foods, or other substances found in the environment?
- Are you on any prescription or over-the-counter medications or pills?
- Have you had any recent illnesses or surgeries?
- Have you been treated for any medical or surgical problems in the past?
- Do you have any significant family history of medical or surgical problems?
- What is your occupation?
- Do you use any of the following: drugs, alcohol, or tobacco products?

Ocular

An ocular history provides information on which eye or eyes are involved, present visual aids, current ocular health status and management, past ocular history, and family ocular history. At this stage, questions to the patient would include:

- Which eye is involved or are both eyes involved?
- Do you wear glasses or contact lenses?
- Do you know what your vision was prior to this problem?
- Are you on any prescription or over-the-counter eye medications, ointments, or drops?
- Have you had any recent eye surgery, eye laser surgery, or eye treatment prior to this problem?
- Have you been treated for any medical or surgical eye problems in the past?
- Does your family have a history of eye problems?

Signs and Symptoms

Ocular signs and symptoms and their time and duration provide information necessary to evaluate the extent of eye damage and help determine sight-threatening conditions that require immediate treatment (ocular emergencies). Ascertaining the time and place of the injury and gaining as complete an understanding as possible of the circumstances surrounding the event can provide the additional pertinent information that will lead to proper ocular treatment, management, and referral. Such information can come from the patient, a family member, or other witness to the event. Questions may include:

- What are the signs and symptoms?
- How long have you had these symptoms, and when did they start?
- What was the time and place (location) of the injury, and what actually happened? Give as much detail as possible.
- Were any foreign bodies involved—for example, metal, glass, plastic, wood, a fingernail, paper, and so on? Was the foreign body moving at a high velocity?
- Were you wearing safety glasses (if applicable)?

Ocular Examination

The basic screening examination can be performed with minimal equipment; it includes visual acuity testing; an external eye examination, with or without a slit lamp; and a direct ophthalmoscopic eye examination. The order in which these procedures are performed depends on the severity of the damage, the availability of ocular equipment, and the patient's cooperation. It is always best, when possible, to document any ocular finding with a drawing and/or photograph.

Visual Acuity Testing

Visual acuity, especially at far, is the most important information that can be obtained for any eye condition under evaluation. Record the best-corrected visual acuity possible; this can range from excellent vision (20/20) to no vision [no light perception (NLP)]. Record a degree of vision, even if it is only your best estimate of visual function. In a true ocular emergency, visual acuity testing can be postponed until the patient's condition is stabilized. Once stabilized, acuity is remeasured. If acuity readings cannot be obtained, this fact must be recorded in the patient's chart. Visual acuity testing includes the following steps:

- Determine the visual acuity of each eye separately at far using the patient's current visual aids (glasses, contact lenses) and/or pinhole. If a Snellen visual acuity chart is available, use it in the testing.
- Determine the visual acuity of each eye separately at near using the patient's current visual aids (such as bifocals) and a pocket near-vision card—if one is available. If a near-vision card is not available, use a newspaper, magazine, or the like, and make a record of the type of text used and the reading distance.

External Eye Examination

The external eye examination provides information about the overall appearance of facial features around the eyes and of external eye structures. A more detailed inspection using a penlight will allow you to note any structural involvement, obvious trauma, drainage, discharge, discoloration, and pupil appearance and reaction to light. The external evaluation also

includes a simple eye test to evaluate eye movement or gaze, intraocular eye pressure, anterior chamber angles, visual field (VF) size, corneal integrity, and obvious foreign bodies. The external eye examination includes the following steps:

- Examine the ocular adnexa and eye structures—cornea, sclera, conjunctiva, anterior chamber, iris, eyelids, eyelashes, eyebrows, lacrimal (tear) system, and orbital wall—for asymmetry, color, discharge, and anything that appears asymmetrical or abnormal.
- Look for obvious lacerations, trauma, injuries, or bruises.
- Check for any drainage or discoloration: itching, black eye (ecchymosis), excessive tearing (epiphora), redness (injection), or swelling (edema).
- Note any type of abnormal appearance in the anterior chamber (AC): pus (hypopyon), blood (hyphema), or vitreous.
- Measure and record pupil size and shape, the reaction of the pupil to light, and its accommodative reflex. Check especially for afferent pupillary defect [a Marcus-Gunn (MG) pupil], where the pupil, which would normally constrict with a light stimulus, dilates instead.
- Check gaze in all directions for any abnormal movement, such as extraocular motility (EOM) defect, cross-eyes (exo = out, eso = in), or double vision (diplopia), by having the patient follow a pen up and down, right and left, and at diagonals. Note that this test is contraindicated when a ruptured globe is apparent or suspected.
- Measure intraocular pressure (IOP) using any type of tonometer available (a Schiotz tonometer, for example) or, if none is available, palpating the eye to see if it is hard or soft (do not palpate the eye if there is any question about globe integrity). Intraocular pressure can be significant for eye injury diagnosis.
- Measure the anterior chamber depth (angles) by holding a penlight stationary at the temporal canthus of the eye and shining the light across the iris to check for shadow length.
- Measure side (peripheral) vision by using the confrontation field method. Have the patient sit approximately 2 1/2 feet away, looking straight ahead at your nose. Have the patient close or cover the right eye while you close or cover your left. Place your right hand in the far peripheral field until it is not visible to you. Then move your fingers in from the side slowly until the patient indicates they are visible to him or her. Compare this point to the point at which you first see your fingers. Repeat the finger movement until all four directions have been covered: up and down, right and left. Then alternate eyes and hands. You are using your eyes as an approximate reference point to check the patient's visual field size and to note any VF defects.
- Check for corneal and conjunctival (eye wall) integrity with a fluorescein strip or drops and cobalt blue light, when applicable.
- Evert the eyelids and check the fornices (conjunctival cul-de-sacs).

Direct Ophthalmoscopic Eye Examination

Most general offices and emergency facilities have a direct ophthalmoscope for a nondilated intraocular eye examination. The direct ophthalmoscope is used to evaluate retinal red reflex and visual media clarity, and to determine the presence of any gross abnormalities, edema, or hemorrhages of the optic nerve, retinal vessels, fovea, and macula. The examination includes the following steps:

- Check for red reflex of the retina first.
- View the visual axis—cornea, anterior chamber, lens, and vitreous—for any opacities, hemorrhages, or foreign bodies.
- Check the optic nerve (disc) and vessels for any abnormalities, disc margin clarity, edema, hemorrhages, exudates, masses, and scars.
- Check the fovea and macula for any abnormalities, edema, hemorrhages, exudates, masses, and scars.

The following ocular conditions, signs and symptoms, immediate actions, and evaluations and treatments are intended to provide non-ophthalmologist eye-care examiners with a quick and easy method for assessing ocular emergencies. All actions and treatments should be performed under the direct supervision of the treating ophthalmologist.

True Ocular Emergencies (Minutes Count)

Chemical Burns

Eye exposure to chemical agents can result in the following signs and symptoms: a painful decrease in vision with severe burning, epiphora, injection, corneal edema, conjunctival swelling (chemosis), and sensitivity to light (photophobia). The eyelid may go into spasm (blepharospasm), making it very difficult for the patient to open the involved eye for effective irrigation. When available, topical anesthetic eye drops or an eyelid speculum can be useful; otherwise, if possible, pull the lower eyelid down and evert the upper eyelid for better irrigation of fornices.

Immediate Action

- Apply immediate, copious irrigation, washing the eye continuously for 15–20 minutes with the nearest available water source.
- If you suspect or know that the chemical is *alkali*, irrigate the eye for a good 30–60 minutes or more, especially over the cornea.
- Do not stop irrigation until a litmus paper shows neutral (that is, shows a pH of 7 to 7.4).
- Take a detailed history to help identify the offending agent and determine if the appropriate neutralizing agent is available and what the potential outcome is. (*Common alkaline agents* include ammonia, fertilizers, window cleaners, drain cleaners, chemical cleaners and detergents, lye, lime, and industrial solvents; *common acid agents* include household bleach and battery acid.)
- Refer the patient immediately to an ophthalmologist.

Evaluation/Treatment

When the involved eye has been stabilized with sterile saline irrigation for about 30–60 minutes or until a litmus paper test shows that the pH of tears is neutral, the eye is checked for any foreign bodies by everting the upper eyelid and sweeping the fornices. A complete ocular examination is performed, and slit-lamp biomicroscopy is used to meticulously inspect the ocular surface to evaluate the extent of tissue damage. The eye is treated with topical antibiotic and/or steroid eye drops to prevent infection and inflammation.

Acute Angle Closure Glaucoma

In *acute angle closure glaucoma*, a convex iris blocks the passage of aqueous through the trabecular meshwork. The condition usually has the following signs and symptoms: a sudden increase in IOP that causes a painful decrease in vision, with fixed mid-dilated pupil, hazy and edematous cornea, injection, colored halos around lights, and frontal headaches that can be associated with abdominal pain, nausea, and vomiting.

Immediate Action

- Take a good history and check visual acuity. (Acute angle closure glaucoma is seen more often in hyperopes.)
- Measure the IOP and evaluate the angles.
- Refer the patient immediately to an ophthalmologist.

Evaluation/Treatment

It is imperative that the ophthalmologist reduce the IOP of the involved eye immediately by any or all of the following means:

- applying topical ophthalmic beta-blocker drops
- applying a topical miotic (green-top eye drops, such as Pilocarpine)
- applying topical ophthalmic steroid drops every 15 minutes for the first hour, and then applying them hourly until IOP is stable
- giving a carbonic anhydrase inhibitor, either orally or intravenously (IV), *if not allergic to sulfa drugs*
- giving an osmotic agent orally or intravenously
- performing a laser iridotomy
- performing a surgical peripheral iridectomy if the laser does not relieve the pupillary block

The IOP is rechecked every 45 to 60 minutes until it decreases significantly, the cornea is clear, and the anterior chamber is quiet. Once the eye is stable, a more thorough ocular examination is conducted, with slit-lamp biomicroscopy, gonioscopy (if there is no corneal edema), and indirect ophthalmoscopy.

Central Retinal Artery Occlusion

A *central retinal artery occlusion (CRAO)* is an acute blockage of the central retinal aretery by an embolus (see Figure 1). The disease usually results in the following signs and symptoms: profound, painless, unilateral vision loss; afferent pupillary defect [Marcus-Gunn (MG) pupil]; narrowed retinal arterioles; pale optic disc; diffuse gray to white pallor of the posterior retina, except the fovea, which appears as a cherry-red spot. It is sometimes associated with a carotid bruit.

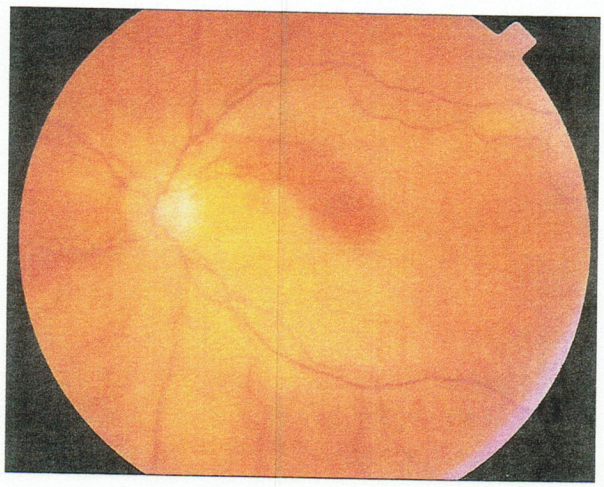

Figure 1. Central retinal artery occlusion. Note that the cilioretinal artery is open (area of pink retina).

Immediate Action

- Refer the patient immediately to an ophthalmologist.
- Take a good history (ask especially about diseases that cause hardening of the arteries) and perform a direct ophthalmoscopic examination.
- Check pupil reaction to penlight and measure IOP and visual acuity.

Evaluation/Treatment

It is very important that treatment for CRAO be initiated immediately—within less than 24 hours—to lower IOP. The IOP of the involved eye can be reduced and central retinal arterial perfusion might be restored by any or all of the following means:

- performing immediate digital ocular massage
- giving topical glaucoma drops and systemic carbonic anhydrase inhibitors to lower the IOP
- performing an anterior chamber tap or paracentesis, which may lower IOP if done within 24 hours of an attack

Once the eye is stabilized, a more complete ocular examination, slit-lamp biomicroscopy, and indirect ophthalmoscopy can be performed. A more complete workup by an internist can also be done: an erythrocyte sedimentation rate (ESR), if not already done, to rule out temporal arteritis; a carotid ultrasound to rule out carotid insufficiency; a blood pressure and diabetic evaluation; and an echocardiogram to rule out heart and valve dysfunction.

Urgent Ocular Emergencies (Hours Count)

Penetrating/Perforating Trauma

Penetrating ocular trauma occurs when an object enters the eye but does not exit and/or an intraocular foreign body (IOFB) is retained in the eye (see Figure 2). *Perforating ocular trauma* occurs when an object enters and exits the eye. Penetrating and perforating trauma result in some or all the following signs and symptoms, depending on the severity of the trauma: pain, foreign-body sensation, the actual presence of an IOFB (glass, metal, plastic, wood, and so on), full-thickness laceration (may present as a puncture-type wound), decreased visual acuity (at the impact site), hyphema, subconjunctival hemorrhage, bulging eyeball (proptosis), IOP that is either elevated or reduced, edema, ecchymosis, diplopia, and orbital hematoma.

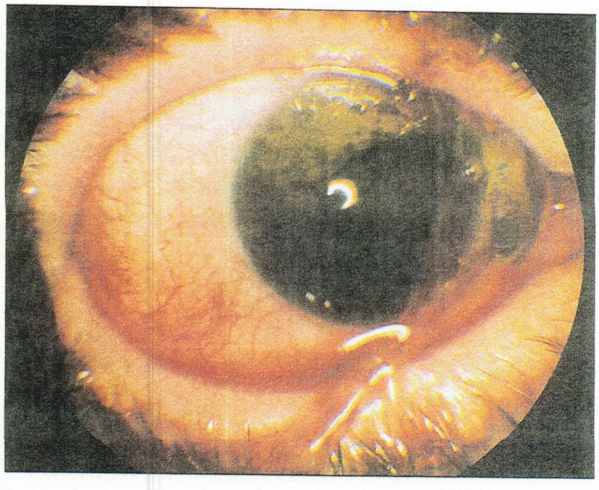

Figure 2. Penetrating trauma wound. Note the peak pupil, hyphema, and iris prolapse.

Action

- Take a good history, including details of the traumatic circumstances, and check visual acuity.
- Place a protective shield over the eye if no IOFB is present.
- Do not treat the eye.
- Instruct the patient not to eat or drink anything, as immediate surgery may be indicated.
- Keep the patient's activity restricted and quiet.
- Refer the patient immediately to an ophthalmologist.

Evaluation/Treatment

Penetrating and perforating trauma may be further evaluated with a complete ocular examination, slit-lamp biomicroscopy, indirect ophthalmoscopy, x-rays and/or CT scans (to rule out the presence of an IOFB or orbital fracture), and B-scan ultrasonography. Treatment includes applying topical ophthalmic antibiotics (possibly fortified), administering systemic antibiotic/anti-inflammatory agents, and removing the foreign body surgically.

Ruptured Globe

With a ruptured globe, the integrity of the globe has been compromised by an open, jagged-edged wound. Such a wound can be caused by blunt trauma or the impact of a high-velocity object. It is often associated with widespread tissue damage and a high risk of dislocated lens, retinal detachment, and vitreous hemorrhage. A ruptured globe usually results in the following signs and symptoms: severe subconjunctival hemorrhage, conjunctival laceration, an irregular or pear-shaped pupil (look for perforation at the peak of the pupil), hyphema, and lens opacity. Often ruptured globes are accompanied by orbital fractures, which may produce hypesthesia over the cheek area, a palpable step-off notch along the orbital rim, and diplopia.

Action

- Take a good history, including details of the traumatic circumstances, and check visual acuity.
- Place a protective eye shield over the eye if no IOFB is present.
- Do not treat the eye.
- Instruct the patient not to eat or drink anything, as immediate surgery may be indicated.
- Keep the patient's activity restricted and quiet.
- Refer the patient immediately to an ophthalmologist.

Evaluation/Treatment

A ruptured globe can be further evaluated with a complete ocular examination, slit-lamp biomicroscopy, and indirect ophthalmoscopy. If an IOFB is suspected, B-scan ultrasonography, x-rays, or CT scans might be considered. Once the diagnosis of ruptured globe has been made, immediate surgical repair is the priority. Concomitant topical and systemic antibiotic therapy should be instituted. The prognosis for vision is usually guarded.

Severe Ocular Infections

Severe ocular infections include endophthalmitis, preseptal cellulitis, orbital cellulitis, and corneal ulcers.

Endophthalmitis (see Figure 3) is a purulent intraocular inflammation that occurs most often after intraocular surgery and that usually manifests itself with the following signs and symptoms: decreased vision (can occur rapidly), eye pain, hypopyon, cells and flare in the anterior chamber, corneal edema, chemosis, and injection. The prompt administration of intraocular antibiotics, often combined with intracameral antibiotics, is the initial treatment for endophthalmitis. Topical fortified and systemic antibiotics are also administered.

Preseptal cellulitis is inflammation of the soft tissue of the eyelid, in front of the orbital sep-

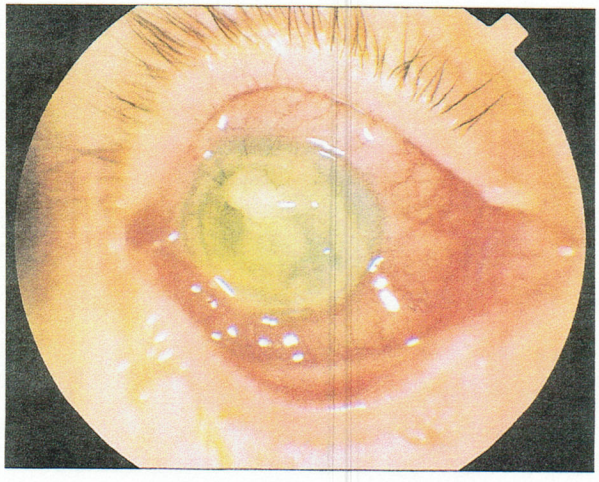

Figure 3. Endophthalmitis (after a corneal transplant)

tum. It usually has the following signs and symptoms: lid edema, lid tenderness and redness, lid warmth, chemosis, mild fever, irritability, no proptosis, no extraocular muscle restriction, and no pain on eye movement. The condition is treated with systemic antibiotics for 10 days and warm compresses to the tender area.

Orbital cellulitis is inflammation of the cellular and connective tissue of the eye. The following signs and symptoms are often manifestations of the disease: fever, headaches, blurred vision, eye pain, restrictive extraocular eye movements, chemosis, injection, diffuse redness of the skin area (erythema), purulent discharge, diplopia, proptosis, optic nerve swelling (papilledema), and increased lid edema. Very aggressive treatment is warranted, with hospitalization and antibiotics administered intravenously to prevent optic atrophy, meningitis, brain abscess, and cavernous sinus thrombosis, which can be life-threatening.

A *corneal ulcer* (see Figure 4) is inflammation of the cornea and anterior chamber cell with corneal tissue loss. It usually has the following signs and symptoms: decreased vision (can occur rapidly), eye pain, injection, photophobia, hypopyon, mucopurulent drainage, and corneal infiltrates. The condition is treated with topical antibiotic drops (may be fortified) around the clock. Treatment is adjusted according to culture and sensitivity findings.

Action (for all severe ocular infections)

- Take a good history (diabetes, chronic illness, or immunological suppression may harbor a fungal infection) and ocular examination.
- Collect the appropriate materials so cultures and smears can be obtained.
- Refer the patient immediately to an ophthalmologist.

Evaluation/Treatment

Endophthalmitis, preseptal cellulitis, orbital cellulitis, and corneal ulcers are further evaluated using slit-lamp biomicroscopy, indirect ophthalmoscopy, culture and sensitivity studies, Gram's stain, blood tests (CBC, SMA, ESR), x-rays, and CT scans. Medical and surgical treatment will be tailored to the severity of the infection.

Less Urgent Ocular Emergencies

Blunt Eye Trauma

Blunt eye trauma is caused by a contusive blow to the eye. Blunt eye trauma often causes lid ecchymoses and subconjunctival hemorrhage. Hyphema is seen with more severe blunt trauma. *Ecchymosis* around the eye is caused by traumatic bleeding into the skin of the eyelid. *Hyphema* is blood in the anterior chamber of the eye (see Figure 5). Blunt eye trauma usually results in the following signs and symptoms: ecchymosis, hyphema, subconjunctival hemorrhage, blurred visual acuity, photophobia, and various degrees of discomfort.

Action

- Take a good history and ocular examination. Check the visual acuity of both eyes separately.

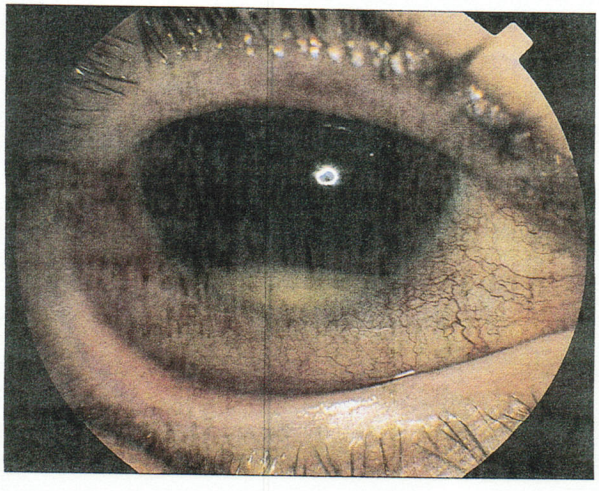

Figure 4. Classic presentation of hypopyon

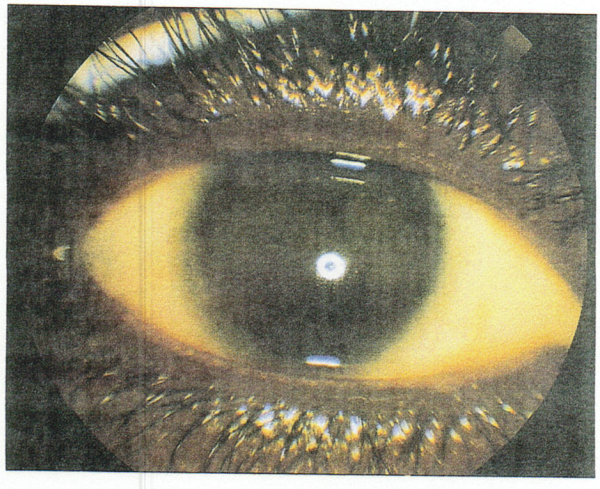

Figure 5. Classic presentation of hyphema

- Treat the patient as if he or she has a ruptured globe.
- Place a protective eye shield over the eye.
- Advise the patient not to use any aspirin (acetylsalicylic acid) products.
- Do not treat the eye.
- Keep the patient's activity restricted and quiet.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Blunt eye trauma can be further evaluated with slit-lamp biomicroscopy, indirect ophthalmoscopy, B-scan (to rule out retinal detachment), x-rays and CT scans (if indicated, to rule out IOFB). Rebleeding, after initial hyphema, is possible in 5%–10% of cases, usually within a week's time. Treatment of blunt eye trauma varies with the degree of severity.

Neovascular Glaucoma with Increased IOP

Neovascular glaucoma is caused by abnormal new blood vessel growth in and on the iris and the trabecular meshwork, leading to angle closure with an increase in IOP and a painful eye. Treatment is urgent, as angle closure can result within days. Neovascular glaucoma with increased IOP usually shows the following signs and symptoms: elevated IOP, eye pain, injection, decreased vision, photophobia, halos around lights, new blood vessels on the iris (if active) or at the pupillary margin, mild cells and flare in the anterior chamber, peripheral anterior synechiae, and optic nerve cupping.

Action

- Take a good history and check visual acuity.
- Measure the IOP.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Neovascular glaucoma with increased IOP can be further evaluated with a complete ocular examination, slit-lamp biomicroscopy, gonioscopy, and indirect ophthalmoscopy. The cause of neovascular glaucoma may be clarified by fluorescein angiography or carotid ultrasound. The IOP of the involved eye is reduced by any or all of the following means:

- applying topical ophthalmic steroid drops (to reduce inflammation and pain)
- applying topical ophthalmic glaucoma drops
- administering carbonic anhydrase inhibitors
- performing laser photocoagulation
- performing glaucoma valve surgery (if medical and laser therapies are ineffective in controlling the pressure)

Flashes and Floaters

Flashes and floaters can be symptoms of something as minor as a posterior vitreous detachment or as serious as a vitreous hemorrhage, retinal tear(s), or retinal neovascularization. *Posterior vitreous detachment (PVD)* is the separation of the vitreous gel from the retinal surface, usually from aging; visual acuity is usually unchanged. A *vitreous hemorrhage (VH)* is blood in the vitreous of the eye (see Figure 6); it usually leads to a painless, unilateral decrease in vision. A *retinal tear* or *hole* is a break in the retinal tissue that by itself causes no loss of vision (see Figure 7). *Retinal neovascularization* is new blood vessel formation due to *branch vein occlusion (BVO)* or *proliferative diabetic retinopathy (PDR)*; usually it leads to a painless, unilateral decrease in vision.

Posterior vitreous detachment, vitreous hemorrhage, retinal tear or hole, and retinal neovascularization all usually lead to the following signs and symptoms: light flashes (photopsia), a shower of floaters, and a spot in the line of vision.

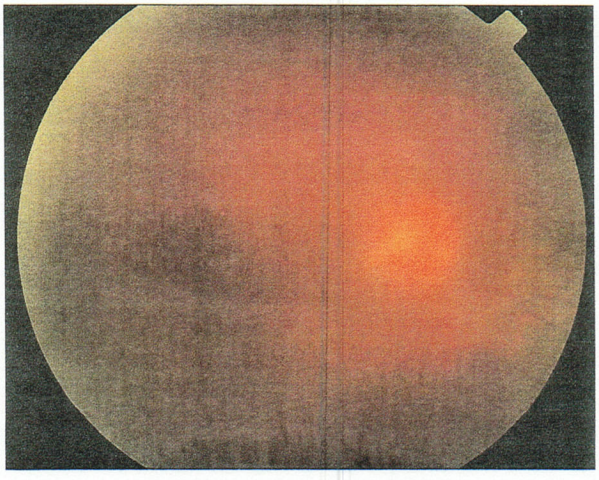

Figure 6. Vitreous hemorrhage

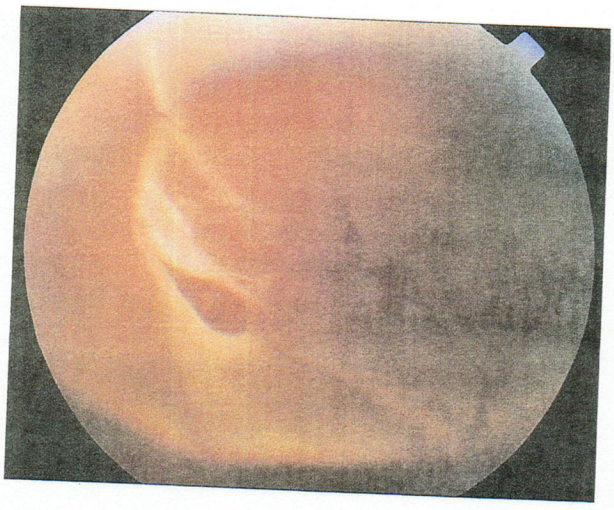

Figure 7. Retinal detachment with two retinal tears

Action

- Take a good history, including determining the source and duration of the signs and symptoms, and a good ocular examination.
- If retinal surgery is anticipated, the patient should be instructed not to eat or drink anything.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

The best way to distinguish among the various types of flashes and floaters is with a comprehensive ocular examination, slit-lamp biomicroscopy, indirect ophthalmoscopy, and a B-scan (if indicated). Treatments vary depending on the severity of the condition and on whether complications develop. In brief, however, posterior vitreous detachment is best treated by educating the patient to report any new floaters. Vitreous hemorrhage may require a surgical intervention if the blood in the vitreous does not resorb spontaneously. Retinal tears and holes are usually treated with laser photocoagulation or cryopexy. Retinal neovascularization, which includes branch vein occlusion and proliferative diabetic retinopathy, may be treated with laser photocoagulation.

Nontraumatic Red Eye

The most common causes of a nontraumatic red eye are viral, allergic, and bacterial conjunctivitis; iritis; subconjunctival hemorrhage; and acute angle closure glaucoma (which was discussed under True Ocular Emergencies).

Viral conjunctivitis (pink eye) usually has the following signs and symptoms: initial unilateral, then bilateral, involvement; redness; clear mucus discharge (excessively weepy eyes); swollen nodes in front of the ears (preauricular); and chemosis. Viral conjunctivitis is extremely contagious. Treatment includes the use of artificial tears, topical ophthalmic antibiotic drops, topical ophthalmic decongestant drops, and cold compresses. Use of good handwashing technique is important when dealing with patients with viral conjunctivitis.

Allergic conjunctivitis usually has the following signs and symptoms: usually bilateral involvement; redness; stringy, whitish discharge; epiphora; itching; edema; and injection. Treatment includes the use of topical artificial tears, topical ophthalmic decongestant drops, cold compresses, and systemic antihistamines.

Bacterial conjunctivitis usually has the following signs and symptoms: initial unilateral, then bilateral, involvement; redness; crusty lids; chemosis; and mucopurulent discharge (if excessive, test for gonococcal conjunctivitis and inclusion conjunctivitis). Treatment includes the use of topical ophthalmic antibiotic drops and warm compresses.

Iritis usually has the following signs and symptoms: usually unilateral involvement, redness, eye pain, photophobia, epiphora, and cells and flare in the anterior chamber. Treatment includes the use of topical ophthalmic steroid drops and topical cycloplegic drops.

Subconjunctival hemorrhage (nontraumatic) may develop spontaneously—sometimes from coughing or sneezing and sometimes for no apparent reason (the patient notices a hemorrhage on the sclera upon awakening in the morning). The following signs and symptoms are manifestations of this condition: spontaneous (nontraumatic) unilateral involvement, redness (mild irritation), and blood under the conjunctiva; usually it is asymptomatic, with no pain or discomfort. No treatment is necessary, as the condition will disappear on its own in 2 or 3 weeks. Mild topical medicated eye drops or topical artificial tears may be used for patient comfort.

Sudden Vision Loss

Sudden vision loss can be caused by a number of conditions, including retinal detachment with macular involvement, acute macular hole, reti-

nal occlusions, amaurosis fugax, and temporal arteritis vs. anterior ischemic optic neuropathy.

Retinal Detachment with Macular Involvement

Retinal detachment with macular involvement is the separation of the retina from the underlying pigment epithelium, which involves the macula (see Figure 8). The following signs and symptoms are manifestations of this condition: sudden severe decrease in vision, often with a shower of floaters; photopsia; and a curtain or veil in the peripheral vision.

Action

- Take a good history and ocular examination.
- If retinal surgery is anticipated, the patient should be instructed not to eat or drink anything.
- Keep the patient's activity restricted.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Retinal detachment with macular involvement can be further evaluated with slit-lamp biomicroscopy (especially with a 90-diopter or Hruby lens), indirect ophthalmoscopy, and B-scan ultrasonography. This condition is treated with a variety of vitreo-retinal surgical techniques.

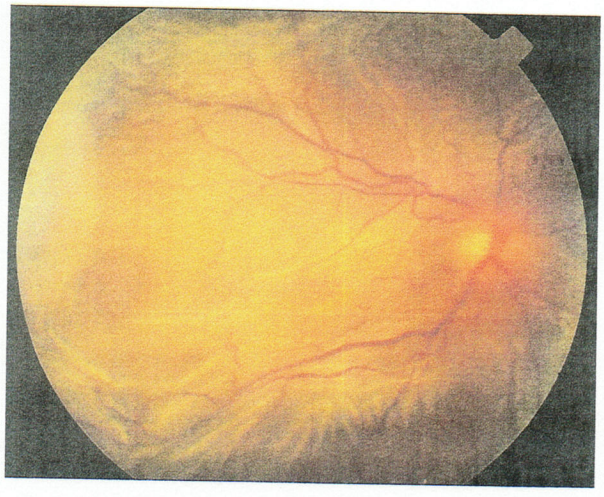

Figure 8. Total retinal detachment with macular involvement

Acute Macular Hole

An *acute macular hole* is a hole in the macular area (central acuity area of the retina). It usually manifests itself with the following signs and symptoms: a painless, sudden, significant unilateral decrease in vision; a macular hole (round red spot); macular edema (gray halo); and yellow deposits in the macular hole.

Action

- Take a good history and ocular examination.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

An acute macular hole can be further evaluated with slit-lamp biomicroscopy (especially with a 90-diopter or Hruby lens), indirect ophthalmoscopy, and fluorescein angiography. Treatment may include a pars plana vitrectomy with air/fluid exchange. Certain patients may be candidates for vitrectomy surgery combined with intraocular steroids and growth factors.

Retinal Occlusions

Retinal occlusions include central retinal vein occlusions, branch retinal vein occlusions, and branch retinal arteriole occlusions. Retinal occlusions block blood flow, thus creating an area in the retina without oxygenation (ischemia) and resulting in varying degrees of tissue damage. The longer the blockage is present, the greater the vision loss.

A *central retinal vein occlusion (CRVO)* is a blockage of blood flow in the central retinal vein. The condition usually has the following signs and symptoms: a painless decrease in vision in one eye, dilated and engorged retinal vessels, intraretinal hemorrhages, swollen optic disc margins, and retinal thickening. The most common cause of neovascular glaucoma is a central retinal vein occlusion.

A *branch retinal vein occlusion (BVO)* is a blockage of blood flow in one of the branching veins of the central retinal vein. The condition usually has the following signs and symptoms: a painless decrease in vision in one eye, dilated and engorged vessels, flame-shaped hemorrhages, macular swelling, and cotton-wool spots ("fluffy" white deposits within the retinal nerve fiber layer).

A *branch arteriole occlusion (BAO)* is a blockage of blood flow in one of the branching arterioles of the central retinal artery. The condition usually has the following signs and symptoms: a painless decrease in vision in one eye, dilated and engorged vessels, and visual field defects.

Action

- Take a good history and ocular examination.
- If directed by an ophthalmologist, obtain a visual field.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Retinal occlusions can be further evaluated with slit-lamp biomicroscopy, indirect ophthalmoscopy, fundus photography, and fluorescein angiography. The patient should be referred for a comprehensive medical evaluation. Treatment may include the use of anticoagulants and sometimes laser photocoagulation.

Amaurosis Fugax

Amaurosis fugax is a transient vision loss caused by a decreased blood flow to the ophthalmic artery. The condition usually has the following symptom: a temporary, painless decrease in vision in one eye that can last from a few minutes to a couple of hours. A Hollenhorst plaque might be seen in the retinal vasculature with associated retinal edema.

Action

- Take a good history and ocular examination.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Amaurosis fugax can be further evaluated with slit-lamp biomicroscopy, indirect ophthalmoscopy, fundus photography, and fluorescein angiography. The patient should be referred for neurological evaluation. Treatment may include the use of anticoagulants. If carotid disease is present, endarterectomy might be indicated.

Temporal Arteritis versus Anterior Ischemic Optic Neuropathy

Temporal arteritis, also known as *arteritic ischemic optic neuropathy* or *giant cell arteritis (GCA)*, is characterized by a sudden painless, unilateral decrease in visual acuity with an associated visual field defect (altitudinal) that may become bilateral. The patient might also complain of malaise, forehead and scalp tenderness (arthritis-type symptoms); pain with chewing; and weight loss. The clinician might see a MG pupil and disc edema. An elevated erythrocyte sedimentation rate (ESR) is often seen in temporal arteritis; a temporal artery biopsy is necessary to confirm the diagnosis.

Action

- Take a good history and ocular examination. (The condition usually occurs in patients over 60 years of age.)
- If directed by an ophthalmologist, obtain a visual field.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Temporal arteritis can be further evaluated with slit-lamp biomicroscopy and indirect ophthalmoscopy. An erythrocyte sedimentation rate should be drawn and medical evaluation should be arranged. Treatment may include a temporal artery biopsy and the urgent administration of systemic steroids. Temporal arteritis is a diagnosis that should not be missed because the vasculitis may affect the contralateral eye.

Anterior ischemic optic neuropathy, also known as *nonarteritic ischemic optic neuropathy (ION)*, usually has the following signs and symptoms: a sudden painless, unilateral decrease in visual acuity; MG pupil; disc edema; and normal ESR.

Action

- Take a good history, trying to elicit symptoms that might suggest temporal arteritis.
- If directed by an ophthalmologist, obtain a visual field.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Anterior ischemic optic neuropathy can be further evaluated with slit-lamp biomicroscopy, indirect ophthalmoscopy, and fundus photography. There is no known effective treatment.

Ocular Injuries

Lid Lacerations

Laceration injuries are divided into the following six levels of severity:

1. Superficial (can be treated by a non-ophthalmologist)

2. Full-thickness (involves the lid margins and functions and ocular abnormalities)
3. Deep laceration of the medial one-third of upper and lower lids (involves the canalicular—the tear duct—system)
4. Deep laceration of the upper lid (the levator muscle, which is often overlooked, may be involved, thus resulting in ptosis)
5. Fat prolapse (caused by globe penetration, IOFB, and impaired lid function)
6. Loss of tissue (skin grafting may be necessary)

Depending on the level of severity, lid lacerations usually manifest with the following signs and symptoms: lid edema, chemosis, hemorrhage, superficial to deep laceration, fat prolapse, and loss of tissue.

Action

- Take a good history, including details of the traumatic circumstances, and a good ocular examination (check especially for IOFB).
- Instruct the patient on the signs and symptoms of infection.
- Use an ice pack to reduce swelling and stop the hemorrhaging.
- If surgery is anticipated, instruct the patient not to eat or drink anything.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Lid lacerations can be further evaluated with slit-lamp biomicroscopy, indirect ophthalmoscopy, exploring the depth and extent of the laceration, x-rays, and CT scans. Treatment may be as simple as using steri-strips (butterfly-type adhesive strips used for closing a minor wound), topical ophthalmic antibiotic/anti-inflammatory ointment, and sterile patches (for superficial lacerations and no IOFB). In more complicated lid lacerations, surgical repair and more complicated reconstructive procedures may be needed.

Superficial Corneoscleral Foreign Body

A superficial corneoscleral foreign body usually has the following signs and symptoms: a feeling as though sand or grit is in the eye (foreign-body sensation), epiphora, photophobia, blurred vision, and corneal rust ring (if the foreign body is metal).

Action

- Take a good history (was the patient wearing safety goggles?) and examine the eye.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

A superficial corneoscleral foreign body can be further evaluated with slit-lamp biomicroscopy and indirect ophthalmoscopy. Treatment may include using topical anesthetic eye drops and removing the foreign body. Because an epithelial defect may result, treat the condition as a corneal abrasion, using topical cycloplegic drops, topical antibiotic eye drops, and a sterile pressure eye patch.

Corneal Abrasion

The most common causes of corneal abrasions are fingernails, fingers, paper edges, and contact lenses. Corneal abrasions usually have the following signs and symptoms: foreign-body sensation, eye pain (especially when exposured to air), epiphora, photophobia, injection, and decreased visual acuity.

Action

- Take a good history and ocular examination.
- If directed by an ophthalmologist, apply topical ophthalmic anesthetic drops, if available.
- Use fluorescein stain (strips) and illuminate with a cobalt blue light, if available (the abrasion will appear yellowish-green).
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

Corneal abrasions can be further evaluated with slit-lamp biomicroscopy and indirect ophthalmoscopy. Treatment may include using topical cycloplegic drops (for comfort), topical ophthalmic antibiotics, and pressure patching. The patient should be seen the next day for follow-up and to check for resolution of the abrasion. The patient should also be informed that recurrent erosion might result from a corneal abrasion.

Subconjunctival Hemorrhage (Traumatic)

A subconjunctival hemorrhage can be seen with minor trauma. It is important to make sure that the subconjunctival hemorrhage does not represent a more serious ocular injury. A complete ophthalmic examination is necessary.

Action

- Take a good history, including details of the trauma, and examine the eye.
- Refer the patient to an ophthalmologist.

Evaluation/Treatment

A traumatic subconjunctival hemorrhage should be further evaluated with slit-lamp biomicroscopy and dilated ophthalmoscopy. Treatment can range from no treatment to surgical intervention depending on the severity of the injury.

Contact Lens Overwear

Contact lens (CL) overwear can lead to the following signs and symptoms: eye pain, blurred visual acuity, photophobia, epiphora, injection, itching, foreign-body sensation, halos around lights, mucus discharge, bulbar conjunctival follicles [which may be a sign of superficial punctate keratitis (SPK)], a flat papillae cobblestone pattern under the eyelid [which may be a sign of giant papillary conjunctivitis (GPC)], and corneal infiltrates (which may be a sign of band keratopathy or corneal ulcer).

Action

- Remove contact lenses.
- Take a good history and examine the eye.
- Record the type, age, and length of wear of the contact lenses, and note the type of cleaning solution and storage solution used, as well as the last time the lenses were cleaned.
- Check the contact lenses for tears, deposits, and a poor fit.
- Apply topical ophthalmic anesthetic drops, with an ophthalmologist's approval, if available.
- Use fluorescein stain (strips) and illuminate with a cobalt blue light, if available (the abrasion will appear yellowish-green).
- Instruct the patient to stop wearing the contact lenses temporarily and to wear glasses.
- Instruct the patient not to return to contact lens wear until the signs and symptoms clear up.
- Refer the patient to an ophthalmologist if the condition is severe or unresolved.

Evaluation/Treatment

Contact lens overwear can be further evaluated with slit-lamp biomicroscopy. General treatment includes discontinuing contact lens wear until an ophthalmologist clears their use again. Conditions that can occur with contact lens overwear include: corneal ulcers, abrasions, and giant papillary conjunctivitis.

Summary

Ophthalmic medical personnel are often the first to interface with a patient with an ophthalmic emergency. The initial medical evaluation often determines the urgency of the treatment and, in some cases, the final visual outcome. By understanding the differential diagnosis of sudden vision loss and the spectrum of injuries associated with ocular trauma, the patient will be better cared for during the initial triage. With a thorough history and screening exam, the OMP can greatly facilitate and improve the care of the patient with an acute ocular emergency.

Lucie S. Elfervig, DNS, is an independent ophthalmic consultant, educator, and researcher with the Vitreo-Retinal Foundation, Memphis, Tennessee.

John L. Elfervig, MD, is a Professor for Clinical/Surgical Vitreo-Retinal Fellowships at the Vitreo-Retinal Foundation, and Associate Professor of Clinical Ophthalmology at the University of Tennessee Medical Center, Memphis, Tennessee.

References

Albert DM, Jakobiec FA, eds: *Principles and Practice of Ophthalmology: Clinical Practice*. Vol. 5. Philadelphia: WB Saunders;1994.

Basic and Clinical Science Course. *External Disease and Cornea*. Section 8. San Francisco: American Academy of Ophthalmology;1994-1995.

Cullom RD, Chang B: *The Wills Eye Manual: Office and Emergency Room Diagnosis and Treatment of Eye Disease*. 2d ed. Philadelphia: JB Lippincott;1994.

Esmaeli B, Elner SG, Schork MA, Elner VM: Visual outcome and ocular survival after penetrating trauma: A clinicopathologic study. *Ophthalmology* 1995;102(3):393–400.

Eye Protection in Sports. Clinical Short Subjects. San Francisco: American Academy of Ophthalmology;1987.

Filipe JA, Barros H, Castro-Correia J: Sports-related ocular injuries: a three-year follow-up study. *Ophthalmology* 1997;104(2):313–318.

Finkelstein M, Legmann A, Rubin PA: Projectile metallic foreign bodies in the orbit: a retrospective study of epidemiologic factors, management, and outcomes. *Ophthalmology* 1997;104(1):96–103.

Glacet-Bernard A, Coscas G, Chabanel A, et al: Prognostic factors for retinal vein occlusion: a prospective study of 175 cases. *Ophthalmology* 1996;103(4):551–560.

Guidelines for the Appropriate Referral of Persons with Possible Eye Diseases or Injuries. Policy Statement. San Francisco: American Academy of Ophthalmology;1995.

Kuhn F, Morris R, Witherspoon CD, et al: A standardized classification of ocular trauma. *Ophthalmology* 1996;103(2):240–243.

Lambert HM: *Retina, Vitreous, and Posterior Segment Trauma*. LEO Clinical Update. San Francisco: American Academy of Ophthalmology;1996.

Margo CE, Mack WP: Therapeutic decisions involving disparate clinical outcomes: patient preference survey for treatment of central retinal artery occlusion. *Ophthalmology* 1996; 103(4):691–696.

Mead MD, Shingleton BJ: *Eye Trauma and Emergencies*. (Slide-script). San Francisco: American Academy of Ophthalmology;1996.

Pieramici DJ, MacCumber MW, Humayun MU, et al: Open-globe injury: update on types of injuries and visual results. *Ophthalmology* 1996;103(11):1798–1803.

Ragge NK, Easty DL: *Immediate Eye Care: An Illustrated Manual*. St.Louis: CV Mosby Co:1990.

Shingleton BJ, Hersh PS, Kenyon KR, eds: *Eye Trauma*. St.Louis: Mosby-Year Book;1991.

Stein HA, Slatt BJ, Stein RM: *The Ophthalmic Assistant: A Guide for Ophthalmic Medical Personnel*. 6th ed. St. Louis: CV Mosby;1994.

Trauma to the Orbit, Eyelids, and Lacimal System. Classic Series. San Francisco: American Academy of Ophthalmology;1982.

The Use of Contact Lenses in an Industrial Environment. Joint Statement of the American College of Occupational and Environmental Medicine and the American Academy of Ophthalmology. San Francisco: American Academy of Ophthalmology;1997.

Varma R, ed: *Essentials of Eye Care: The Johns Hopkins Wilmer Handbook*. Philadelphia: Lippincott-Raven;1996.

WuDunn D, Zimmerman K, Sadun AA, Feldon SE: Comparison of visual function in fellow eyes after bilateral nonarteritic anterior ischemic optic neuropathy. *Ophthalmology* 1997;104(1):104–111.

Examination Questions

The following self-examination questions were designed to meet the learning objectives for this module. To receive 1 CE credit from JCAHPO for this module, you must answer all the questions correctly on the enclosed answer sheet, and return it to the Academy in the envelope provided. One answer sheet can be used for answering questions for one or two modules. Answer sheets are providing for three individuals (only three individuals may request credit per subscription). Those who answer the examination questions successfully will receive a certificate of completion. Fill in the code for this module on the answer sheet in one of the places shown. **Code: 0006**

1 Which of the following ocular emergencies require immediate eye care, where minutes count

a. contact lens overwear and corneal abrasion

b. chemical burns and central retinal artery occlusion

c. iritis and conjunctivitis

d. macular hole and branch vein occlusion

2 A patient presents with flashes and floaters; the ophthalmologist is most concerned about a

a. branch vein occlusion

b. temporal arteritis

c. retinal tear

d. corneal abrasion

3 The most common treatment for spontaneous subconjunctival hemorrhage is

a. none; it usually clears on its own

b. systemic antibiotics

c. laser therapy

d. surgical intervention

4 Some IOFBs are metallic and so a(n) _____ test cannot be done.

a. CT scan

b. MRI

c. B-scan

d. x-ray

5 Which of the following conditions are commonly associated with halos around lights?

a. branch vein occlusion and blunt trauma

b. central retinal vein occlusion and lid laceration

c. contact lens overwear and acute angle closure glaucoma

d. IOFB and scleral laceration

6 In a full-thickness upper lid laceration, what muscle is often overlooked?

a. medial rectus

b. superior oblique

c. lateral rectus

d. levator

7 One of the best procedures for identifying a corneal abrasion is

a. applying dilating drops

b. using a fluorescein strip with a blue light

c. direct ophthalmoscopy

d. checking visual fields

8 All of the following are common causes of corneal abrasions except

a. contact lens overwear

b. fingernail injury

c. watching television

d. paper edge injury

9 Endophthalmitis is best treated with

a. vitrectomy with intraocular antibiotics

b. topical eye medications

c. artificial tears

d. vitrectomy

10 All of the following are common presentations of a retinal detachment except

a. painful loss of vision

b. painless loss of vision

c. a curtain in the line of sight

d. decreased vision

11 Amaurosis fugax exhibits all of the following signs and symptoms except

a. transient vision loss

b. permanent vision loss

c. dot-and-blot hemorrhages

d. halos

12 A patient who comes in with an acute, painful, red eye with elevated IOP should be referred to the ophthalmologist

a. immediately

b. the next day

c. within 3 days

d. in a week

13 An erythrocyte sedimentation rate (ESR) is useful in the diagnosis of

a. glaucoma

b. iritis

c. amaurosis fugax

d. temporal arteritis

14 Disc swelling with a normal ESR is characteristic of

a. myopia

b. blepharitis

c. anterior ischemic optic neuropathy

d. a branch vein occlusion

15 Monocular involvement of a mucopurulent discharge is characteristic of which type of conjunctivitis?

a. allergic

b. atopic

c. bacterial

d. viral

16 Hyphema is commonly associated with

a. conjunctivitis

b. iritis

c. temporal arteritis

d. blunt trauma

17 Orbital cellulitis is associated with all of the following except

a. normal vision

b. decreased ocular motility

c. diplopia

d. proptosis

18 The quick way to determine the infectious agent of a corneal ulcer is with a

a. B-scan

b. Gram's stain

c. fluorescein strip

d. cobalt blue light

19 The classic presentation of posterior vitreous detachment (PVD) is

a. altitudinal visual field defect

b. elevated IOP

c. flashers and floaters

d. mucus discharge

20 A small child with ocular trauma should be prepared for possible surgical intervention by having him or her

a. eat a meal as soon as possible

b. not eat or drink anything

c. take a bath

d. resume normal activity