Eye Care Skills: Presentations for Physicians and Other Health Care Professionals Version 3.0

Eye Trauma and Emergencies

Speaker Notes

Karla J. Johns, MD
Executive Editor

American Academy of Ophthalmology
The Eye M.D. Association

Developed by
Bradford J. Shingleton, MD,
in conjunction with the Ophthalmology Liaisons Committee of the American Academy of Ophthalmology

Reviewer, 2009 Revision
Mary A. O'Hara, MD

Executive Editor, 2009 Revision
Karla J. Johns, MD

Ophthalmology Liaisons Committee
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David Sarraf, MD
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Kerry D. Solomon, MD

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CONTENTS

A GUIDE TO PRESENTING *EYE TRAUMA AND EMERGENCIES* **3**

INTRODUCTION **4**

EVALUATION **5**

History 5

Examination Techniques 6

TREATMENT **6**

Chemical Burns 6

Ruptured or Lacerated Globe 9

Hyphema 12

Orbital Trauma 13

Lid Lacerations 14

Corneal Abrasions and Foreign Bodies 16

Red Eye 20

Cellulitis 24

Herpes Zoster Ophthalmicus 25

Sudden Visual Loss 26

Contact Lens Problems 28

SUMMARY **29**

APPENDIX 1: EYE EXAMINATION TECHNIQUES **30**

APPENDIX 2: THE NONTRAUMATIC RED EYE: DIFFERENTIAL DIAGNOSIS **33**

APPENDIX 3: RESOURCES **34**

A GUIDE TO PRESENTING

Eye Trauma and Emergencies

Eye Trauma and Emergencies presents the principles and techniques of evaluating, diagnosing, and treating critical eye injuries and emergencies. Details are provided to assist the physician and emergency treatment personnel in recognizing eye problems that require urgent treatment. Specific treatment protocols are given, and guidelines for referral are outlined.

The program briefly outlines the history taking and examination skills that are required of physicians evaluating ocular trauma. The examination techniques emphasized are based on equipment available to all physicians in emergency departments.

Diagnosis, treatment, and referral guidelines are included for the following major categories of trauma: chemical burns, ruptured or lacerated globe, hyphema, orbital trauma, lid lacerations, corneal abrasions and foreign bodies, red eye, cellulitis, herpes zoster ophthalmicus, sudden visual loss, and contact lens problems. The program also discusses the care provided by the ophthalmologist once an emergency situation has stabilized.

Four nontraumatic eye emergencies that may be vision-threatening are reviewed and their differential diagnoses presented: conjunctivitis, iritis, corneal infections, and acute angle-closure glaucoma (the major causes of a red eye). Orbital cellulitis is discussed, with an emphasis on the need for radiologic, ophthalmologic, and ENT consultation. Symptoms, signs, diagnosis, and management of herpes zoster ophthalmicus are presented, and the two emergency problems related to sudden visual loss (central retinal artery occlusion and temporal arteritis) are detailed. The program concludes with a discussion of common contact lens problems.

This program provides physicians with a level of familiarity regarding the triage evaluation of eye injuries and emergencies. They will be able to identify problems that require immediate intervention and to initiate appropriate therapy. The also will know when to seek ophthalmology or other specialty consultation.

Approximate Running Time

45-60 minutes

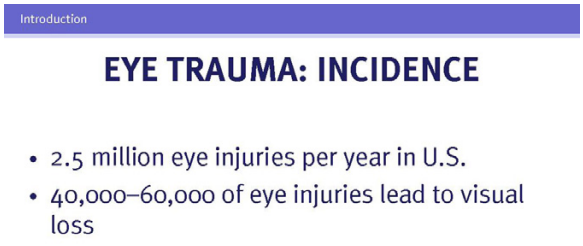
Suggested Audience

- Internists
- Family physicians
- Pediatricians
- Emergency physicians
- Surgeons who participate in the care of patients with multiple injuries
- Medical students, interns, and residents
- Non-MD emergency treatment personnel
- Organizations:
  American Academy of Family Physicians
  American College of Emergency Physicians
  American College of Physicians

INTRODUCTION

SLIDE 1

In the United States, 2.5 million people suffer eye injuries each year, and between 40,000 and 60,000 of these injuries are associated with severe visual loss. In addition to patients visiting physicians for eye trauma, millions more patients annually visit physicians and emergency rooms for nontraumatic, nonemergent eye conditions, such as nonpurulent conjunctivitis, that seem severe to the patient but are not true emergencies.



SLIDE 2

This presentation outlines the emergency treatment of both serious and minor eye problems commonly encountered in an emergency center. Because of the number of eye injuries and nontraumatic eye emergencies encountered yearly, and because the final visual outcome of many ocular emergencies depends on prompt and appropriate triage, diagnosis, and treatment, emergency personnel need to be familiar with these problems to offer prompt and appropriate care.

EVALUATION

SLIDE 3

Severe and vision-threatening damage to the eye is not always easy to identify. Marked lid swelling after blunt trauma, as shown in the slide, may conceal a ruptured globe. An intraocular foreign body may go unnoticed because a patient is unable to cooperate with an examination. A patient with a minor lid injury and good vision may have significant underlying eye damage. Any of these patients may require immediate treatment by an ophthalmologist. To ensure accurate diagnosis and appropriate treatment, a prompt and directed evaluation, including history and examination, is vital in cases of eye trauma.

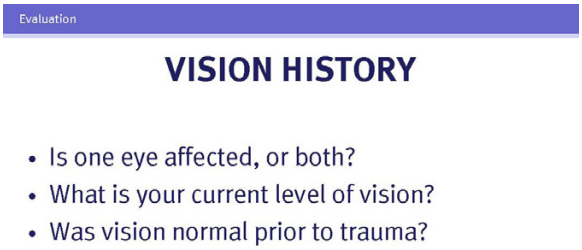
Marked lid swelling after blunt trauma may conceal a ruptured globe

History

SLIDE 4

As with other medical problems, accurate and complete historical data are important in diagnosing and managing eye injuries. In all cases of eye injury, ask the following important questions:

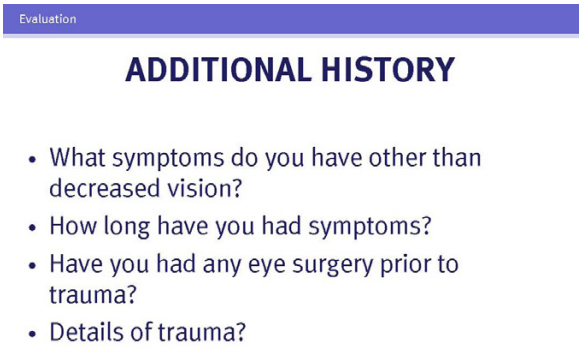
- Is only one eye affected, or both?
- What is the current level of vision?
- Was the vision normal prior to the injury?



SLIDE 5

- Are symptoms other than decreased vision present?
- How long have the symptoms lasted?
- Have any prior ocular surgical procedures been performed?

Additionally, in cases of eye trauma, it is important to ask the patient to describe how the injury occurred.



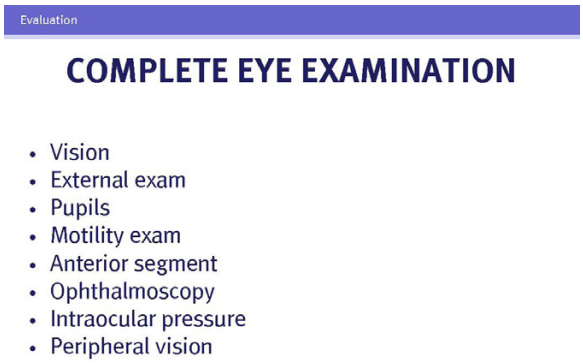
Examination Techniques

SLIDE 6

To avoid overlooking pathology that is important but occult, one should consider all eight parts of the complete eye examination in each patient. These are:

- Visual acuity measurement
- External examination (lids and orbit)
- Pupillary examination
- Extraocular motility evaluation
- Examination of the anterior segment (conjunctiva, sclera, cornea, and lens)
- Ophthalmoscopy of the posterior segment
- Intraocular pressure (IOP) measurement when indicated
- Peripheral vision assessment

Details of each exam component are presented in Appendix 1, “Eye Examination Techniques.”

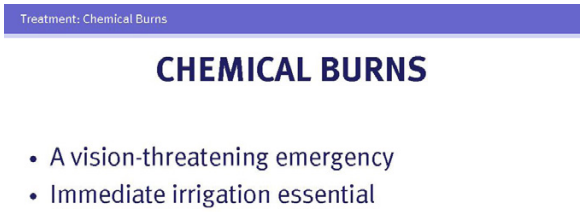


TREATMENT

Chemical Burns

SLIDE 7

A chemical burn of the eye is a vision-threatening emergency that requires immediate treatment. *Immediate irrigation is the initial treatment.* Even though exposure to chemicals can sometimes prove inconsequential, the potential for serious visual loss must always be considered.



SLIDE 8

The full extent of ocular damage from chemical burns may not always be readily apparent at the time of initial assessment. Corneas that are at first relatively clear (such as the one shown on the left side of this slide) can eventually opacify or vascularize (as shown on the right), leading to blindness. Alkali burns are generally more disastrous than acid burns because they penetrate the cornea and ocular tissues more deeply and rapidly. Alkaline substances commonly involved in ocular injuries are drain cleaners, chemical cleansers and detergents, fertilizers, and industrial solvents.

Treatment: Chemical Burns

Acute and chronic stages of alkali burn

SLIDE 9

When a telephone call is received in the emergency department about a chemical eye burn, the caller should be instructed to start irrigation immediately with the nearest source of water available. The eyelids should be forcefully held apart while irrigating. If trained emergency personnel are not present at the site of injury, copious irrigation should be performed for 5 minutes and the patient then brought to the emergency department. If trained personnel are available at the site of injury, irrigation should be performed for 10 minutes and continued during transport to the emergency department if possible.

Treatment: Chemical Burns

Irrigation of chemical burns should begin immediately following contact with the substance and continue upon arrival at the emergency department.

SLIDE 10

Upon arrival in the emergency department, the patient with a chemical burn should be seen *immediately*. Defer vision testing. Place topical anesthetic drops in each eye. Gently retract the lids, using a Desmarres eyelid retractor or paper-clip retractor if necessary. Search the conjunctival fornices thoroughly for particulate chemical matter and remove any present with cotton swabs or forceps. Everting the lids may be helpful in these procedures. Then institute copious irrigation.

Treatment: Chemical Burns

CHEMICAL BURNS: INITIAL MANAGEMENT

- Instill topical anesthetic
- Check for and remove foreign bodies
- Institute copious irrigation

SLIDE 11

Perform continuous irrigation with balanced salt solution, normal saline, or Ringer's solution for 10 minutes, regardless of the amount of irrigation done elsewhere. A continuous, rapid drip through large-bore IV tubing is effective if the stream is directed across the everted cul-de-sac and cornea.

Treatment: Chemical Burns

Ocular irrigation

SLIDE 12

After removing particulate matter and performing irrigation, examine the patient. Note the degree of corneal and conjunctival staining with fluorescein. Instill topical cycloplegic (such as cyclopentolate 1% drops) and topical antibiotic drops, and place a shield over the involved eye. Prompt referral to an ophthalmologist is indicated.

Caution: When treating a chemical burn caused by a pressurized chemical, such as riot-control gases or aerosol sprays, be alert for a ruptured globe or a foreign body in the eye.

Treatment: Chemical Burns

CHEMICAL BURNS: TREATMENT FOLLOWING IRRIGATION

- Instill topical cycloplegic and topical antibiotic
- Shield eye
- Refer promptly to ophthalmologist

Ruptured or Lacerated Globe

SLIDE 13

Laceration or rupture of the globe is one of the most serious ocular injuries. A ruptured or lacerated globe must be identified early and managed appropriately to protect the eye from further damage. Remember that vision may remain excellent despite a full-thickness globe laceration or rupture. A lacerated or ruptured globe should be suspected if any of the following seven conditions are present:

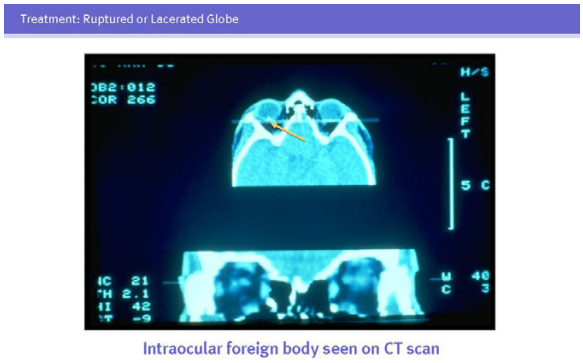
Ruptured or lacerated globe

SLIDE 14

Suspect a ruptured or lacerated globe if the patient reports history of severe blunt trauma, projectile injury, contact with a sharp object, or trauma resulting from hammering metal on metal. A history of an eye injury in the setting of metal-on-metal contact should alert the examiner to the possibility of an intraocular foreign body. A metallic intraocular foreign body is lodged in the retina in this photo.

SLIDE 15

Precise localization of an intraocular foreign body can be made with CT scanning. CT scanning is the procedure of choice, as it allows one to search for occult globe rupture, intraocular foreign body, and orbital fractures. Magnetic resonance imaging should not be performed if there is any question of a metallic foreign body.



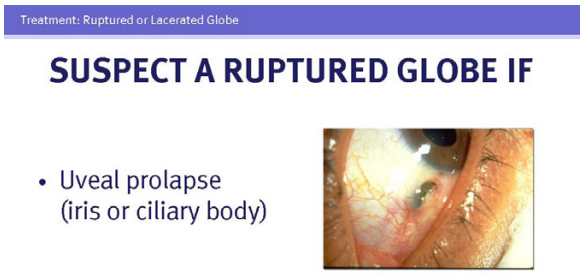
Intraocular foreign body seen on CT scan

SLIDE 16

In an eye with subconjunctival hemorrhage, especially bullous subconjunctival hemorrhage, conjunctival lacerations and scleral rupture or penetration may be present. The patient needs an evaluation by an ophthalmologist to rule out a ruptured or lacerated globe. A patient with any of the remaining five ocular findings should also be referred to an ophthalmologist.

SLIDE 17

Suspect a ruptured or lacerated globe in the presence of uveal prolapse. A brown discoloration of the conjunctiva could represent uveal prolapse (that is, prolapse of the iris or ciliary body) through an ocular laceration or rupture.



SLIDE 18

Suspect a ruptured or lacerated globe in the presence of an irregular or pear-shaped pupil. Because the pupil is formed by uveal (iris) tissue, uveal prolapse through a laceration or rupture could cause an irregularity of the pupil, often pointing to the site of globe laceration or rupture

SLIDE 19

Suspect a ruptured or lacerated globe in the presence of hyphema (blood in the anterior chamber, left) or vitreous hemorrhage (blood in the posterior chamber, right). Both are indicators of significant ocular trauma. Hyphema can usually be detected with a penlight, whereas vitreous hemorrhage may be suspected if there is a loss of the normal retinal red reflex or a hazy view of the retina on ophthalmoscopic viewing

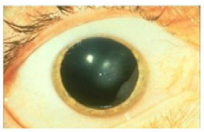
SLIDE 20

Suspect a ruptured or lacerated globe in the presence of a lens opacity. Globe laceration or intraocular foreign body penetration can damage the normally clear crystalline lens of the eye. Damage may be associated with opacification of the lens, demonstrated by penlight examination. Lens opacity and the presence of a foreign body can also be demonstrated by examining the red reflex with a direct ophthalmoscope.

Treatment: Ruptured or Lacerated Globe

SUSPECT A RUPTURED GLOBE IF

- Lens opacity



SLIDE 21

Suspect a ruptured or lacerated globe in the presence of lowered intraocular pressure (IOP). Lowered IOP is common under these circumstances. The examiner should use caution in the evaluation, as undue pressure on a lacerated or ruptured globe could result in extrusion of intraocular contents.

Treatment: Ruptured or Lacerated Globe

RUPTURED GLOBE

- Suspect if intraocular pressure is lowered
- Evaluate cautiously to avoid extrusion of intraocular contents

SLIDE 22

If a ruptured or lacerated globe is suspected, *stop the examination immediately* to avoid excessive manipulation of the eye. *Do not patch the eye*, because the pressure of the patch may extrude the contents of the globe. Instead, place a protective shield over the eye to prevent pressure on the globe. Give tetanus prophylaxis and refer the patient immediately to an ophthalmologist for definitive treatment.

Treatment: Ruptured or Lacerated Globe

IF GLOBE RUPTURE OR LACERATION IS SUSPECTED

- Stop examination
- Shield the eye (do not patch)
- Give tetanus prophylaxis
- Refer immediately to ophthalmologist

SLIDE 23

Protective shields can be metal ones made expressly for this purpose, or they can fashioned out of paper cups, cardboard, or firm plastic. The shield or cup should rest on the orbital bones, putting no pressure on the eye.

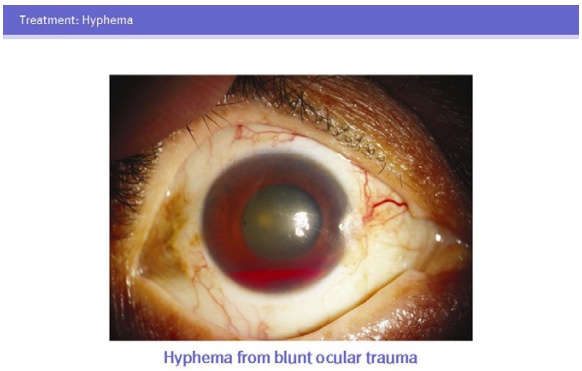
Treatment: Ruptured or Lacerated Globe

Protective eye shields

Hyphema

SLIDE 24

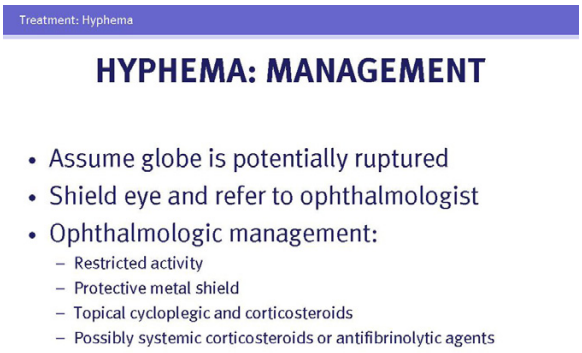
Blunt ocular trauma can cause intraocular bleeding without rupturing the eye. Hyphema, or blood in the anterior chamber, can result from a tear in peripheral iris vessels and is a potentially serious complication of blunt ocular trauma.



Hyphema from blunt ocular trauma

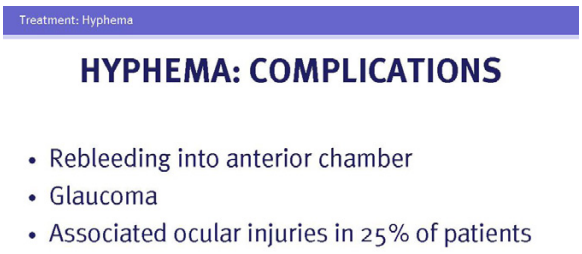
SLIDE 25

Most hyphemas can be readily identified by careful penlight inspection. Manage patients with hyphemas as though they had an open globe. Shield the eye and refer to an ophthalmologist as soon as possible. Typical management of patients with hyphema includes restricted activity, metal shield protection of the injured eye, topical cycloplegia, topical corticosteroids, and possibly systemic corticosteroids or antifibrinolytic agents.



SLIDE 26

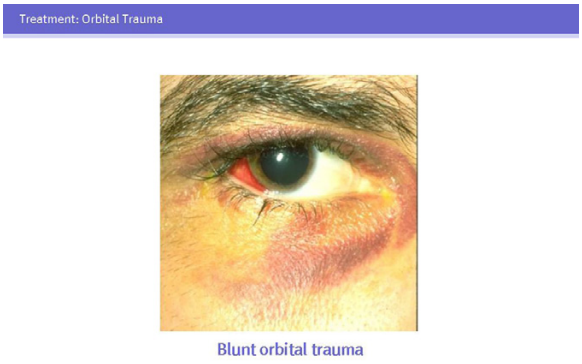
Significant complications associated with a hyphema include rebleeding into the anterior chamber (particularly within 5 days after the initial injury) and a greater risk of developing glaucoma. Twenty-five percent of patients with hyphemas have other ocular injuries, including vitreous hemorrhage, subluxated lens, and retinal damage.



Orbital Trauma

SLIDE 27

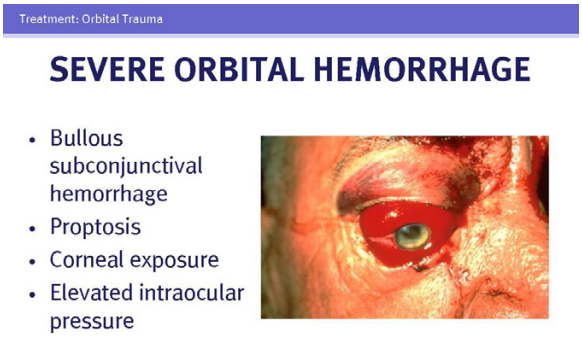
Blunt trauma to the orbit can result in periorbital swelling, ecchymosis, and orbital bone fractures. Hemorrhage into orbital tissues associated with blunt trauma can range form minor lid ecchymoses, which are of no functional significance, to major orbital hematomas. Orbital trauma may also cause mild, nonbullous subconjunctival hemorrhaging, which is typically a benign, self-limited condition.



Blunt orbital trauma

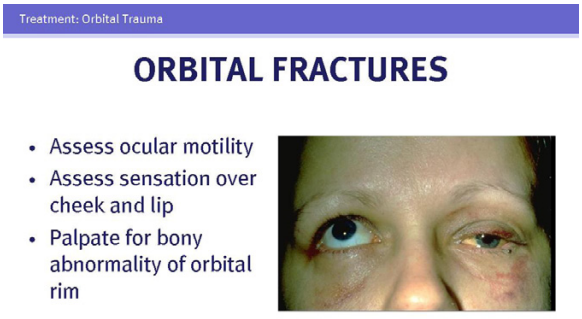
SLIDE 28

Treatment of less serious orbital hematomas consists of cold compresses and pain relievers; ophthalmologic follow up is advised. Major orbital hematomas, however, may produce massive bullous subconjunctival hemorrhage (shown), proptosis, corneal exposure, and a dramatic increase in intraocular pressure. These major orbital hemorrhages may require emergency surgical intervention in an attempt to decrease intraocular pressure and protect the corneal surface.



SLIDE 29

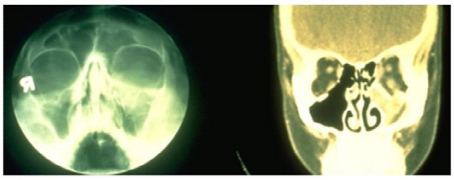
Orbital fractures may be associated with diplopia, which can result from entrapment of or hemorrhage into an extraocular muscle or its nerve supply. An orbital blow-out, or orbital-floor, fracture is typically associated with a decrease in the ability to elevate the eye, as seen in the slide. Orbital fractures also can be associated with epistaxis, decreased sensation over the cheek and upper lip caused by damage to the infraorbital nerve (which runs along the orbital floor), and, with fractures involving the orbital rim, a palpable bony step-off.



SLIDE 30

If any of the above symptoms and signs are present, plain skull x-rays with Waters and Caldwell views will often show bony fractures, soft tissue swelling, or bloody collection in the sinuses. A computed tomographic (CT) scan with coronal and sagittal views can be obtained to delineate more precisely the extent of fractures (especially if surgical intervention is being considered) and to rule out associated cranial injuries.

Treatment: Orbital Trauma



X-ray of skull (Waters or Caldwell view)

CT scan (coronal and sagittal views)

SLIDE 31

Isolated blow-out fractures do not require surgical intervention unless the patient has persistent diplopia in a functional gaze or poor cosmesis. Surgical intervention, if warranted , is generally delayed for several days to weeks, because diplopia may be transient. Ophthalmologic consultation should be sought in all cases of suspected blow-out fracture, because 25% of these fractures are associated with occult ocular trauma.

Treatment: Orbital Trauma

ORBITAL TRAUMA: BLOW-OUT FRACTURES

- Surgery if persistent, nontransient diplopia or poor cosmesis
- Must rule out occult ocular trauma

Lid Lacerations

SLIDE 32

Lid lacerations, although usually the result of sharp injury, may also result from blunt trauma. The emergency physician should assume that lid lacerations are accompanied by an open globe until proven otherwise. In many cases, diagnosis and treatment of the more occult eye problems may take precedence over the readily apparent lid laceration.
The five types of lid lacerations listed in Slides 33–37 warrant attention by an ophthalmologist.

Treatment: Lid Lacerations

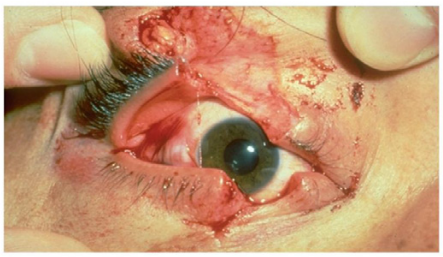
LID LACERATIONS

- Can result from sharp or blunt trauma
- Rule out associated ocular injury

SLIDE 33

Full-thickness lacerations involving the lid margin must be repaired in layers. Improper closure may lead to notching of the lid margin, impaired lid function, and long-term ocular surface sequelae.

Treatment: Lid Lacerations

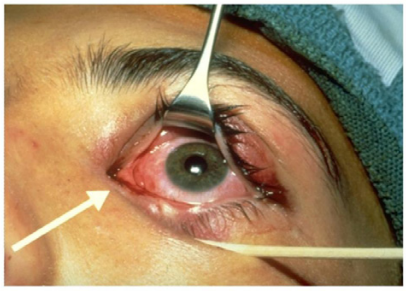


Full-thickness eyelid laceration

SLIDE 34

Any laceration extending into the medial third of the upper or lower lid can involve the tear drainage, or canalicular, system. To avoid persistent tearing, repair must include reapproximation of the severed ends of the canaliculi.

Treatment: Lid Lacerations

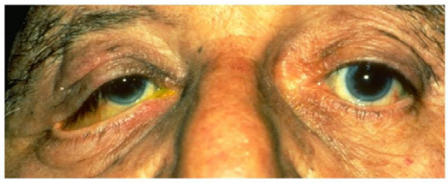


Laceration involving medial third of eyelid may involve tear drainage systems.

SLIDE 35

Deep lacerations of the upper lid can damage the levator muscle. If not recognized and repaired, levator damage can result in a permanent ptosis.

Treatment: Lid Lacerations



Deep laceration of upper eyelid can damage levator muscle.

SLIDE 36

Deep lacerations with fat prolapse are associated with a higher incidence of occult globe penetration, foreign bodies, and impairment of lid function.

Treatment: Lid Lacerations

Deep laceration of upper eyelid with fat prolapse

SLIDE 37

Any lid lacerations with significant loss of tissue should be repaired by an ophthalmologist because skin grafting may be required

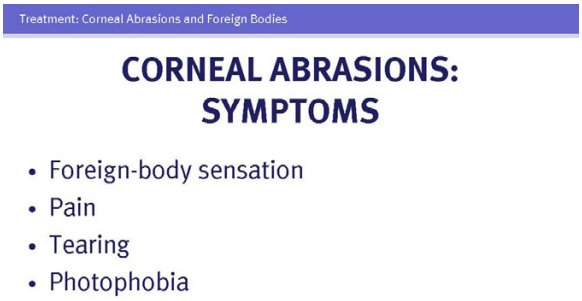
SLIDE 38

Superficial lid lacerations that do not extend to the eyelid margin can be repaired by a nonophthalmologist physician. Care must be taken to avoid repairs that impair normal lid function or preclude a good cosmetic result. Superficial foreign bodies should be removed to avoid skin irregularity and pigmentation changes. Once again, the possibility of foreign-body penetration must be thoroughly investigated. Tetanus prophylaxis is recommended.

Corneal Abrasions and Foreign Bodies

SLIDE 39

Trauma to the eye or exposure to particulate matter may result in corneal abrasions or foreign bodies. A foreign-body sensation with associated pain, tearing, and photophobia are common presenting complaints.



SLIDE 40

Topical fluorescein is helpful in evaluating such corneal injuries. After instillation of a topical anesthetic, a moistened fluorescein strip is applied to the inferior conjunctival surface. The fluorescein is dispersed by blinking, and the eye is then examined under cobalt-blue illumination.

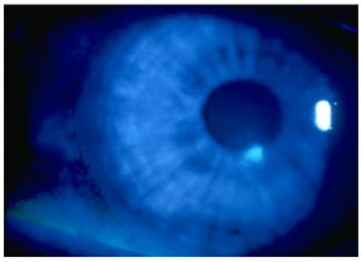
Treatment: Corneal Abrasions and Foreign Bodies

Fluorescein strip applied to the conjunctiva

SLIDE 41

Corneal abrasions and foreign bodies will appear yellow-green against the blue background illumination. Welder's keratitis appears hours after exposure and represents corneal abrasions and epithelial irregularities caused by ultraviolet light. Symptoms are often more marked than the actual ocular examination findings.

Treatment: Corneal Abrasions and Foreign Bodies



Corneal abrasion seen in blue illumination

SLIDE 42

Foreign bodies are not always readily apparent and can often be found lodged under the upper lid. Single and double eversion of the upper lid are important techniques for identifying superficial ocular foreign bodies. (Eversion techniques are described in Appendix 1.) Foreign bodies under the lid can often be removed with a forceful stream of sterile irrigation fluid or a cotton swab.

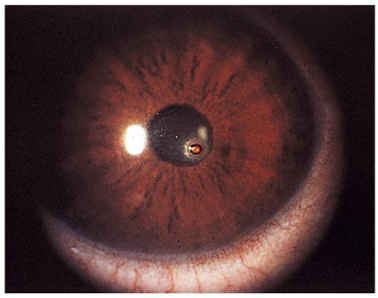
Treatment: Corneal Abrasions and Foreign Bodies

Foreign body lodged under upper eyelid

SLIDE 43

Foreign bodies may also become embedded in the corneal surface, as shown in this slide.

Treatment: Corneal Abrasions and Foreign Bodies



Corneal foreign body

SLIDE 44

Foreign bodies lodged on the corneal surface are more easily and safely removed with magnification, such as a loupe or the slit lamp, after instillation of a topical anesthetic. Sometimes the foreign body can be dislodged with irrigation. In other cases, the beveled end of a syringe needle or a sterile cotton-tipped applicator can be used to aid in dislodging the foreign body. When evaluating patients with corneal foreign bodies, care must be taken to ensure that there are no signs of penetrating injury. A history of the injury during the use of power tools (eg, a grinding wheel) should raise concern that a penetrating injury might be present.

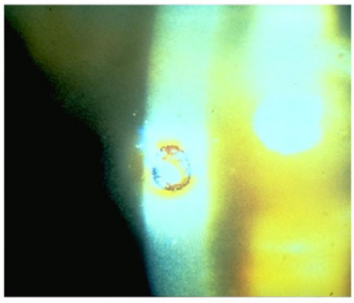
Treatment: Corneal Abrasions and Foreign Bodies

Removal of corneal foreign body using magnification

SLIDE 45

Certain metallic foreign bodies may leave a rust ring after contact with the cornea. Removal of this ring can be difficult and must be done under slit-lamp magnification by a physician experienced with the procedure. It may not be necessary to remove the ring if the overlying epithelium is smooth and the ring is outside the visual axis.

Treatment: Corneal Abrasions and Foreign Bodies



Rust ring after removal of corneal foreign body (slit-lamp view)

SLIDE 46

Following the removal of foreign bodies (if present), instill a topical cycloplegic, such as cyclopentolate 1%, which aids in comfort by decreasing ciliary-body spasm. Then apply a topical antibiotic. Next, a pressure patch may be placed over the treated eye and the patient instructed to wear the patch for 24 hours. The pain of corneal abrasions can be severe, and systemic analgesics may be required.

Treatment: Corneal Abrasions and Foreign Bodies

CORNEAL ABRASIONS: TREATMENT

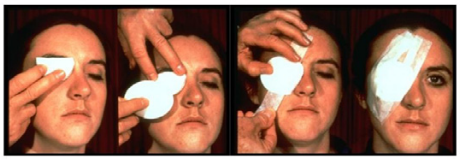
- Topical cycloplegic
- Topical antibiotic
- Pressure patch over eye is an option
- Systemic analgesics often needed

SLIDE 47

Care must be taken to ensure proper placement of an eye pressure patch. First, place a folded eye patch over the patient's closed eyelid. Then place a second, unfolded eye patch over the folded pad. Apply strips of tape firmly over the eye pads. Then pull the ends of the tape down over the cheek and up over the forehead.

Some practitioners have advocated not patching if the abrasion is small. Cycloplegic and antibiotic drops, perhaps combined with a nonsteroidal anti-inflammatory drop should still be used.

Treatment: Corneal Abrasions and Foreign Bodies



Placement of a pressure patch

SLIDE 48

Corneal abrasions in contact lens wearers represent a distinct sub-group. The contact lens should be removed immediately and left out. These patients need Gram-negative antibiotic coverage and should not be patched because the risk of corneal ulceration is significantly higher in these patients. All contact-lens-related abrasions should be followed up by an ophthalmologist in 24 hours.

Treatment: Corneal Abrasions and Foreign Bodies

CORNEAL ABRASIONS: CONTACT LENS WEARERS

- Remove contact lens
- Antibiotics for Gram-negative organisms
- Do not patch
- Follow up with ophthalmologist in 24 hours

SLIDE 49

A patient who has been treated for corneal abrasion should be reexamined in 24 hours to ensure that the cornea is healing properly. If the epithelial defect is not closed, or if a white infiltrate has appeared on the cornea in the area of previous injury, referral to an ophthalmologist is indicated. *Never* prescribe topical anesthetics for home use.

Treatment: Corneal Abrasions and Foreign Bodies

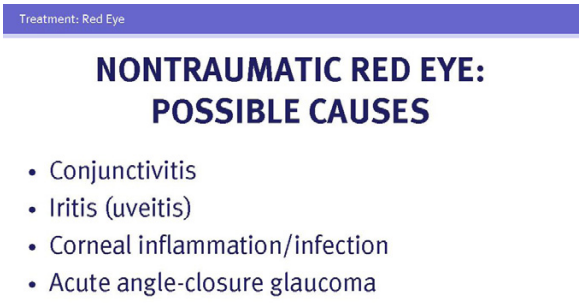
CORNEAL ABRASIONS: FOLLOW-UP

- Follow up in 24 hours
- Refer to ophthalmologist if
  - Not healed in 24 hours
  - Abrasion is related to contact lens wear
  - White corneal infiltrate develops

Red Eye

SLIDE 50

A red eye can result from many causes other than trauma. Four major diagnoses should be considered in a patient with a red eye without a history of trauma: conjunctivitis, iritis, corneal inflammation or infection, and acute glaucoma. Although conjunctivitis is typically benign and self-limited, it can be confused with the other three conditions, all of which require prompt diagnosis and appropriate treatment and referral.

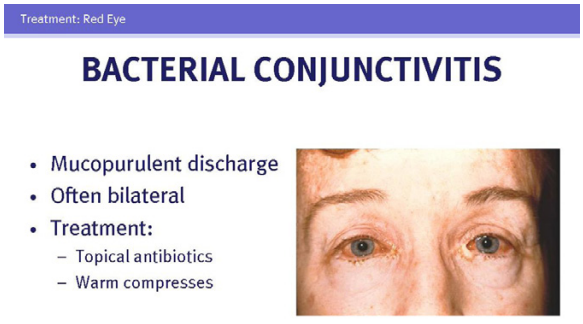


SLIDE 51

Viral conjunctivitis is the most common type of conjunctivitis. It may be associated with a systemic viral illness, and patients present with conjunctival inflammation and a watery or mucoid discharge often with preauricular lymphadenopathy. Viral conjunctivitis is usually bilateral. Symptomatic relief may be obtained with vasoconstricting agents, artificial tear drops, and warm or cold compresses. Routine use of antibiotics is not indicated for viral conjunctivitis. Adenoviral conjunctivitis is easily transmitted through hand-eye contact and often spreads rapidly from person to person. Minimize contact with ocular secretions and employ sound hand-washing techniques.

SLIDE 52

Bacterial conjunctivitis results in a more mucopurulent discharge than that seen in viral conjunctivitis. It is often bilateral. The corneas are clear and vision is usually normal. Patients are usually otherwise healthy. Bacterial conjunctivitis is best treated with topical antibiotics and moist, warm compresses. A typical case will improve over 7 to 10 days with treatment.

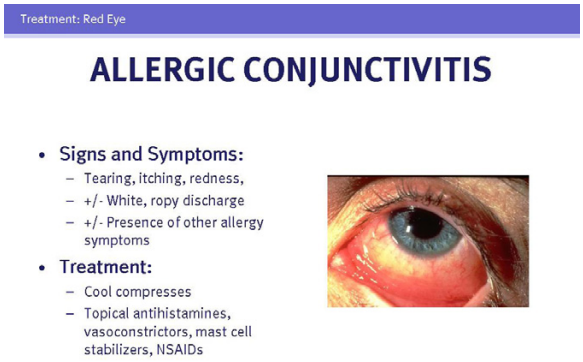


SLIDE 53

A special category of bacterial conjunctivitis is gonococcal conjunctivitis. Gonococcal conjunctivitis should always be considered when a markedly purulent conjunctivitis is present. Management of gonococcal conjunctivitis includes consultation with an ophthalmologist, hospitalization, and parenteral as well as topical antibiotic therapy.

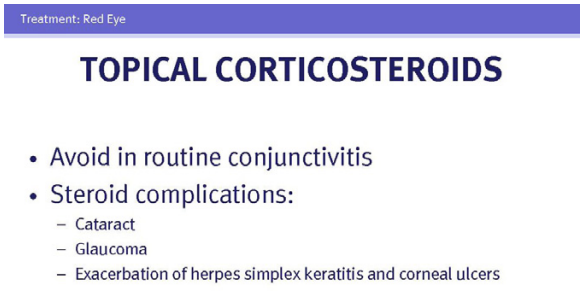
SLIDE 54

Allergic conjunctivitis results in tearing, itching, redness, and swelling of the conjunctiva. Itching is the most prominent of these symptoms. If discharge is present it is typically white and ropy in nature. Hay fever and asthma sufferers will often present with these complaints on a seasonal basis. The treatment of most allergic ocular conditions by the emergency center team should include cold compresses, topical antihistamines and vasoconstrictors, and, occasionally, oral antihistamines. Topical mast cell stabilizers and nonsteroidal anti-inflammatory drops can also provide excellent relief for patients with chronic allergic conjunctivitis.



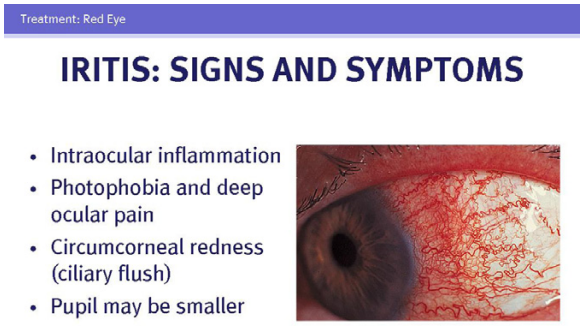
SLIDE 55

Topical corticosteroids should *not* be used to treat conjunctivitis prior to ophthalmologic consultation. Corticosteroids can cause cataracts and glaucoma, aggravate a herpes simplex infection, or worsen an infectious corneal ulcer. Both herpes keratitis and corneal ulceration can be confused with conjunctivitis.



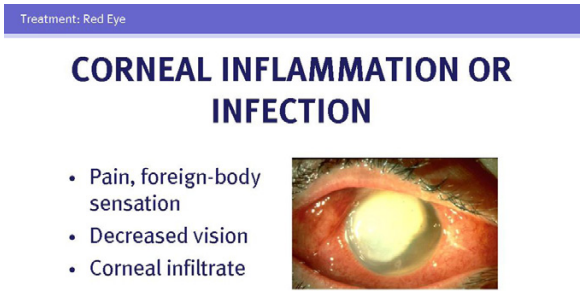
SLIDE 56

Iritis is intraocular (anterior segment) inflammation. Patients often complain of photophobia and deep ocular pain. Vision might be slightly blurred. The redness tends to be circumcorneal and the pupil may be smaller on the involved side. Iritis may be a manifestation of systemic infection or inflammation and should be confirmed by slit-lamp examination. On slit-lamp examination, white blood cells can be seen in the anterior chamber. Treatment often involves topical corticosteroids coordinated by the ophthalmologist.



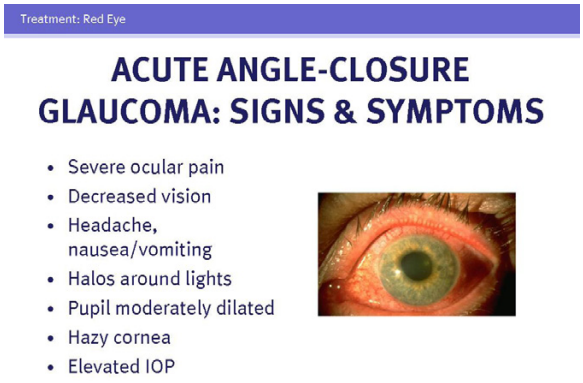
SLIDE 57

Corneal inflammation or infection results in significant pain, foreign-body sensation, and decreased vision. The corneal surface often stains with fluorescein. There may be underlying corneal infiltration and ulceration, as shown in the slide. This is an ocular emergency requiring prompt referral to an ophthalmologist. Topical antibiotics should not be instilled until diagnostic microbiologic scrapings of the ulcer have been performed. The ophthalmologist will then direct appropriate antibiotic, antifungal, and, possibly, corticosteroid treatment.



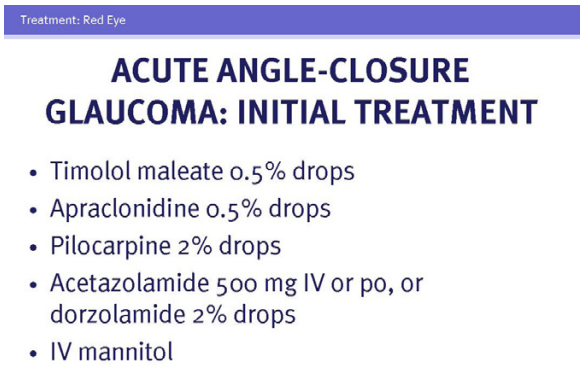
SLIDE 58

Patients with acute angle-closure glaucoma present with severe eye pain and decreased vision. Symptoms may also include headache, nausea, vomiting, and colored halos around lights. Signs of acute glaucoma include pupillary dilation, a hazy cornea, and elevated intraocular pressure. Acute angle-closure glaucoma is an ocular emergency. The intraocular pressure needs to be lowered as quickly as possible. It is helpful for the ophthalmologist to examine the patient during an acute attack to confirm the diagnosis. However, immediate treatment should be instituted if ophthalmologic evaluation will be delayed.



SLIDE 59

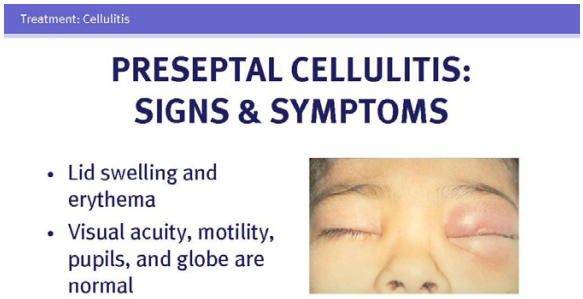
Initial therapy for angle-closure glaucoma may include a topical beta blocker (for example, timolol 0.5%); a topical alpha agonist (for example, apraclonidine 0.5%); topical pilocarpine 2%; topical, oral, or parenteral carbonic anhydrase inhibitor (topical dorzolamide 2%, oral or IV acetazolamide 500 mg); and/or parenteral osmotic agents such as IV mannitol given as a rapid (20 minutes) intravenous infusion. Antiglaucoma medications should be used with caution because of the risk of cardiac abnormalities, metabolic imbalances, and severe dehydration. Definitive treatment requires a laser opening into the iris (iridotomy) by an ophthalmologist.



Cellulitis

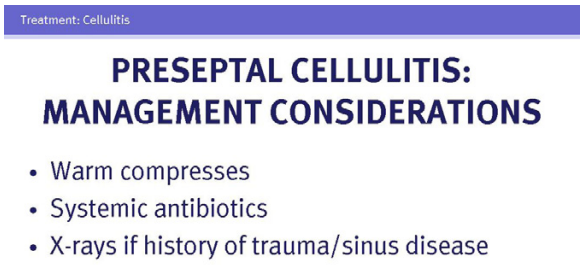
SLIDE 60

Cellulitis is an urgent and potentially vision-threatening problem. The distinction between preseptal and orbital cellulitis is important. Preseptal cellulitis implies involvement of only anterior lid structures and periorbital tissues. The eye is normal. Examination will reveal lid swelling and erythema, but visual acuity, motility, and ocular structures will be normal.



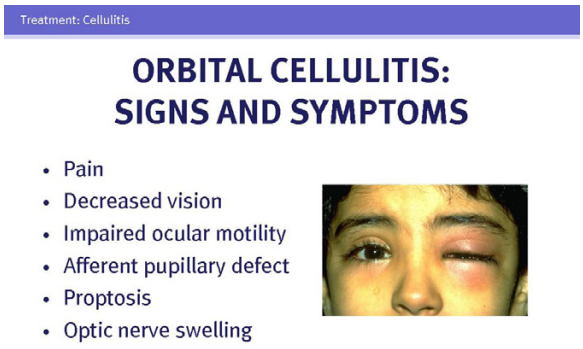
SLIDE 61

Treatment includes warm compresses and systemic antibiotics Plain x-rays should be obtained if there is a history of trauma or sinus disease, and an ophthalmologist should be consulted.



SLIDE 62

Orbital cellulitis is a more serious disorder than preseptal cellulitis. It implies involvement of the orbit itself and is often accompanied by pain, decreased vision, impaired ocular motility, an afferent pupillary defect, proptosis, and/or optic nerve swelling. Cavernous sinus thrombosis may develop.



SLIDE 63

Treatment of orbital cellulitis is an emergency and includes hospital admission, cultures of nasopharynx and blood, intravenous antibiotics, immediate radiologic, ophthalmologic, and ENT consultation, and potential surgical debridement. Persons with orbital cellulitis who have diabetes or are chronically ill or immunologically suppressed may harbor mucormycosis, a rapidly progressive fungal infection.

Treatment: Cellulitis

ORBITAL CELLULITIS: MANAGEMENT

- Immediate treatment
- Nasopharynx and blood cultures
- Intravenous antibiotics
- Surgery may be necessary
- Rule out mucormycosis in immunocompromised patients

Herpes Zoster Ophthalmicus

SLIDE 64

Herpes zoster is a dermatomal disease caused by the varicella-zoster (chickenpox) virus. Involvement of the ophthalmic division of the fifth cranial nerve (V1) is common. Patients with herpes zoster infection frequently present with pain and vesicular eruption

Treatment: Herpes Zoster Ophthalmicus

Herpes zoster ophthalmicus

SLIDE 65

Patients with V_1 zoster often have prodromal fever and scalp tenderness. Respect for the midline of the forehead is key in diagnosis. Some patients with V_1 zoster have ocular involvement. If the tip of the nose is involved, ocular involvement is more likely (Hutchinson's sign). Ocular involvement may occur in the form of corneal lesions or iritis and must be searched for by slit-lamp examination. Hygiene of the skin lesions is important. Oral acyclovir is indicated.

Treatment: Herpes Zoster Ophthalmicus

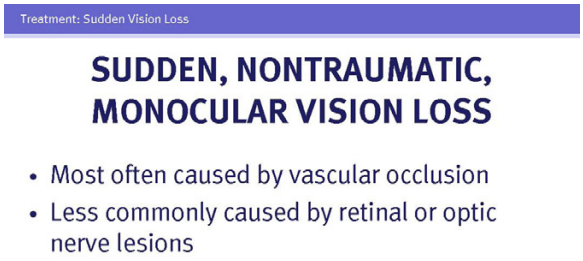
HERPES ZOSTER OPHTHALMICUS

- Prodromal fever and scalp tenderness
- Respect for forehead midline
- Ocular involvement
  - Corneal lesions
  - Iritis

Sudden Visual Loss

SLIDE 66

Patients with sudden loss of vision frequently present to the emergency room. Rapid unilateral painless loss of vision is caused in general by problems involving the retina or optic nerve. These include central retinal artery occlusion, central retinal vein occlusion, retinal detachment, optic neuropathy caused by temporal arteritis, nonarteritic optic neuropathy, and vitreous hemorrhage. A meticulous ophthalmoscopic examination and search for an afferent pupillary defect are important in narrowing the list of possible diagnoses. Central retinal artery occlusion and temporal arteritis are both true emergencies and require rapid institution of therapy.



SLIDE 67

Central retinal artery occlusion, or CRAO, is associated with a sudden and profound unilateral loss of vision. There may be a prior history of transient ischemic attacks or prior episodes of transient visual loss. Examination will reveal an ipsilateral afferent pupillary defect (testing method is described in Appendix 1, “Eye Examination Techniques”). Ophthalmoscopic examination will reveal narrowed retinal arterioles and diffuse, gray retinal pallor in all areas except the reddish foveal region, giving the appearance of a “cherry-red spot.”

SLIDE 68

Emergency treatment should be directed to decreasing intraocular pressure and to vasodilation in an attempt to allow the obstructing embolus to pass into less critical, more distal, smaller-caliber vessels. The ophthalmologist should be contacted immediately. Management may include rebreathing CO_2, topical beta blockers, intravenous acetazolamide, and intermittent, direct digital massage of the globe through closed eyelids. Paracentesis of the anterior chamber can also dramatically and quickly lower the intraocular pressure and possibly dislodge a critical central arterial blockage. Paracentesis, the drainage of aqueous fluid out of the anterior chamber to lower intraocular pressure, may be performed by an ophthalmologist.

Treatment: Sudden Vision Loss

CRAO: MANAGEMENT

- Rebreathe CO_2
- Timolol maleate 0.5%
- IV acetazolamide 500 mg
- Massage globe with lids closed
- Paracentesis in some cases

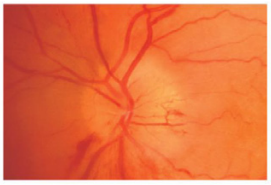
SLIDE 69

Temporal arteritis, also called giant cell arteritis, is a potentially blinding disorder of both eyes. It tends to occur in people older than 65 years of age. Patients present with unilateral decreased vision, an afferent pupillary defect, optic nerve swelling (shown), and tenderness over the forehead and scalp. Patients may complain of pain with chewing, or jaw claudication, and there may be symptoms of polymyalgia rheumatica. Involvement of the second eye may quickly follow if untreated.

Treatment: Sudden Vision Loss

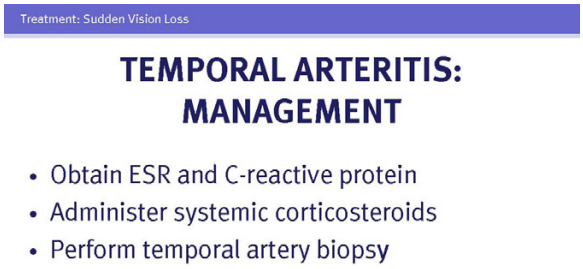
TEMPORAL ARTERITIS: SIGNS AND SYMPTOMS

- Unilateral loss of vision
- Afferent pupillary defect
- Optic nerve swelling
- Scalp/forehead tenderness
- +/- Chewing pain
- +/- Polymyalgia rheumatica



SLIDE 70

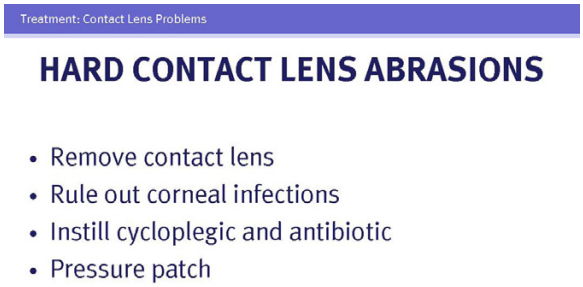
An erythrocyte sedimentation rate (ESR) and a C-reactive protein level must be obtained immediately and, if elevated, high doses of systemic corticosteroids are essential to prevent vision loss, which can be irreversible. Even if vision is lost in one eye, protection of the fellow eye is essential and crucial to prevent bilateral blindness. A temporal artery biopsy should be done to confirm the diagnosis, but it will remain positive for 2 weeks despite initiation of corticosteroids. Central retinal artery occlusion can also occur with temporal arteritis, and the ESR must therefore be checked in these patients also.



Contact Lens Problems

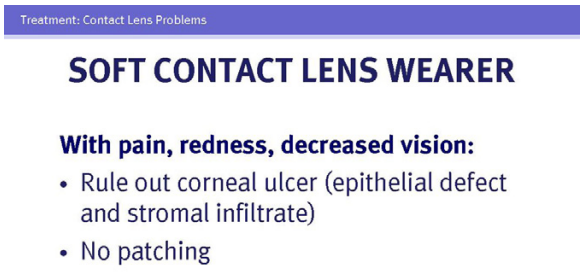
SLIDE 71

Contact lens wearers will often complain of pain and seek assistance after wearing their lenses for excessive periods. In wearers of hard contact lenses, these symptoms are generally caused by corneal abrasions. Treatment includes removal of the offending lens, verification that no corneal infection is present, instillation of cycloplegic and antibiotic drops, and pressure patching. In general, corneal reepithelialization will require 12 to 24 hours. Contact lenses should not be worn until the epithelium is well healed.



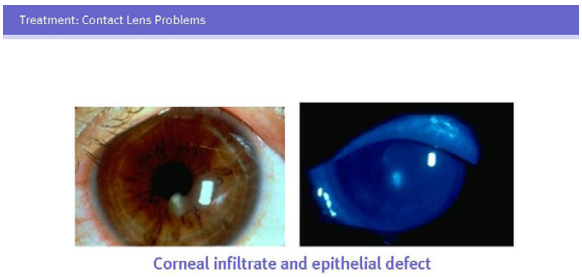
SLIDE 72

When wearers of soft contact lenses present with pain, redness, or decreased vision, it is essential to rule out an infectious corneal ulcer. Such ulcers are more common in patients who wear soft contact lenses, but they can also occur in those who wear hard lenses. Because of this risk, patching is not recommended for abrasions related to soft contact lens wear.



SLIDE 73

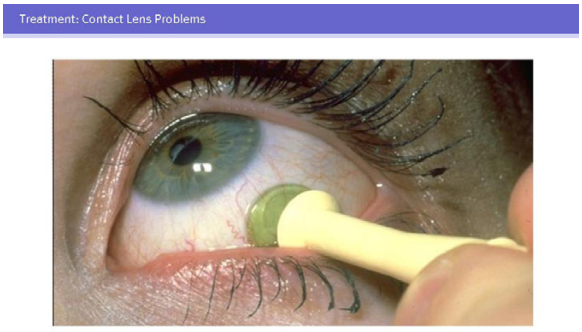
An epithelial defect with an underlying white stromal infiltrate is shown on the left of this slide. On the right, fluorescein helps with the visualization of the epithelial defect. A corneal ulcer should be promptly referred to an ophthalmologist for diagnostic scrapings of the ulcer bed and initiation of intensive topical antibiotic therapy.



Corneal infiltrate and epithelial defect

SLIDE 74

Hard contact lenses may become displaced but can be realigned by gentle pressure through the lids or by the use of a suction cup. The patient can continue to wear the lens after realignment if there is no corneal abrasion. It is recommended that soft lens problems be referred directly to an ophthalmologist.

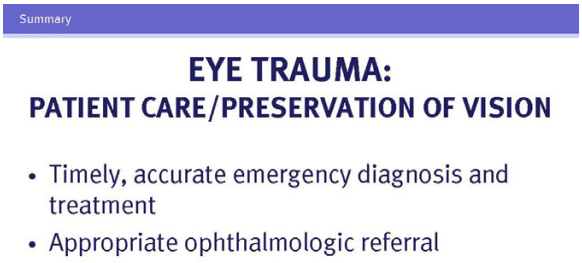


Removing a hard contact lens with a suction cup

SUMMARY

SLIDE 75

The emergency center physician should feel confident in treating many ocular problems and initiating management and appropriate timely referral of other more serious eye disorders. High-quality emergency center treatment combined with appropriate ophthalmologic intervention will result in the best care and greater potential for preservation of vision for the patient with an ocular emergency.



APPENDIX 1

Eye Examination Techniques

Visual Acuity

Measurement of visual acuity is the first step in any eye examination. The only exception is the case of a chemical burn, when vision should be tested after emergency eye irrigation

A standard Snellen eye chart is recommended for determining visual acuity. Record the vision for each eye separately. Record the patient's distance from the chart and the smallest letter size correctly identified. If the patient normally wears distance glasses, they should be worn during the eye test. If the distance glasses are broken or lost, use a multiple pinhole occluder. If a Snellen chart is not available, use a near vision card, newspaper, or magazine and record the smallest-size word and the distance at which the patient can read it accurately. Patients over 40 may require their reading glasses for such near vision acuity measurements.

In many cases of serious injury, the patient is unable to read even the largest letter on an eye chart. If this is the case, record the distance at which he or she can *count fingers* with the affected eye. If the patient cannot count fingers, determine the distance at which *hand movement* can be detected. If the patient is unable to detect hand movement, determine whether he or she can *perceive light*.

External Examination (Lids and Orbit)

Examine the lids to determine whether they open and close completely. Ensure the integrity of the lid margins and note any swelling or change in color. In cases of trauma, examine the orbit for subcutaneous emphysema, defects in the orbital rim, localized areas of anesthesia, and exophthalmos or enophthalmos. Orbital x-rays may be required.

Foreign bodies may be lodged on the palpebral conjunctiva of the upper lid or high up in the cul-de-sac formed by the reflection of the palpebral and bulbar conjunctiva. To check for such foreign bodies, examiners must be able to perform single and double eversion of the upper eyelids.

Single Eversion of the Upper Eyelids

Expose the undersurface of the upper lid as follows:

1. Ask patient to look down.
2. Place the stick portion of a cotton swab approximately 10 mm above the upper lash margin.
3. Grasp the eyelashes with the other hand and gently pull straight out from the globe.
4. Pull the lashes up toward the forehead and flip the eyelid over, using the applicator stick as a fulcrum.
5. Hold the eyelashes against the orbital rim with your thumb and withdraw the applicator.

Double Eversion of the Upper Eyelids

Expose the upper cul-de-sac as follows:

1. Ask the patient to lie down.
2. Instill topical anesthetic.
3. Place a lid retractor on the lid above the tarsal plate, grasp the eyelashes, and evert the lid over the retractor.
4. Tilt the retractor back toward the forehead and use it to hold the lid outward to expose the upper cul-de-sac.

Pupillary Examination

The pupils should be black, round, and equal in size, and should react to light. Any deviation from these norms may indicate a serious problem. In any case of trauma or decreased vision, check the eye for a relative afferent pupillary defect (Marcus Gunn pupil). To perform this test, shift a light back and forth from pupil to pupil, waiting for several seconds at each eye to watch for dilation. A normal pupil will constrict in response to illumination, but a lesion of the optic nerve (or certain extensive retinal problems) will cause the pupil to dilate when the light is transferred to its side from the previously illuminated normal eye. A positive afferent pupillary defect (dilation of pupil with light) confirms the presence of an organic defect, and identifies the lesion within the optic nerve or retina.

Motility Examination

Check each eye for fullness of excursion and nystagmus in four positions of gaze—up, down, right, and left. Extraocular movements should be symmetrical between the two eyes.

Anterior Segment of the Globe

Inspect the sclera/conjunctiva for color change (injection, etc), swelling (chemosis), discharge, foreign bodies, and lacerations. Desmarres lid retractors or folded paper clips may be used to retract the lids for adequate exposure.

The cornea overlies the iris and pupil and is typically clear and transparent. It should appear lustrous and compact and should demonstrate a sharp light reflex when inspected with a penlight.

The anterior chamber is the space between the cornea and the lens/iris plane. The depth of the anterior chamber should be symmetrical between the two eyes and free of blood (hyphema) or pus (hypopyon). The anterior chamber is best viewed with the aid of a slit-lamp biomicroscope. The lens sits just posterior to the pupil and should appear optically clear to penlight inspection.

Ophthalmoscopy

Use the direct ophthalmoscope to examine the optic nerve, blood vessels, and macula of each eye. If the ocular media are clear, the examiner will observe a brilliant red reflex when the light from the ophthalmoscope fills the pupil. Use the direct ophthalmoscope, with appropriate focusing, to assess optic nerve color and elevation. Follow the vessel arcades in each direction to look for retinal hemorrhages or exudates. View the macular region last by having the patient look directly at the examination light.

Intraocular Pressure (IOP)

Measurement of intraocular pressure is particularly helpful in evaluating cases of suspected angle-closure glaucoma. For an initial determination, manually comparing the pressure of the two eyes by using digital pressure on the globe through closed lids is probably sufficient.

Schiøtz tonometry (if available) can be performed as follows:

1. First check the calibration of the tonometer on the metal foot plate in the instrument's case; the instrument should read 0 (zero) units on the scale.
2. Ask the patient to lie down.
3. Fit the tonometer with the 5.5 gram weight.
4. Instill 1 drop of topical anesthetic in each eye.
5. Ask the patient to stare at the ceiling or at his or her thumb held about 2 feet in front of his or her nose.
6. Gently spread the lids apart, holding your fingers against the orbital rims and being sure to avoid applying pressure on the globe.
7. Holding the tonometer as vertical as possible, gently place it on the central cornea.

8. Observe and record the position of the pointer on the scale. If the pointer reads 3 scale units or less, the intraocular pressure is elevated. Use the card in the tonometer to convert scale units to millimeters of mercury (mmHg).
9. Repeat steps 5–8 for the other eye.
10. Follow the manufacturer's recommended procedure for disinfecting the tonometer to avoid transmitting infectious diseases between patients.

A portable electronic tonometer (TonoPen) is frequently available in emergency room or primary care settings. A training video for this device is available from the manufacturer.

Do not attempt tonometry or digital evaluation of intraocular pressure if a ruptured globe is suspected. Also avoid tonometry in cases of active conjunctival or corneal infection.

Peripheral Vision Examination

In cases of altered vision or head trauma, it is important to test the patient's peripheral vision. The confrontation method, described below, is useful for such documentation.

1. Carefully occlude the fellow eye of the patient in order to test one eye at a time.
2. Sit opposite the patient.
3. Instruct the patient to fixate with the eye to be tested on your open eye directly opposite.
4. Hold one, two, or three fingers of each hand in the nasal and temporal fields simultaneously and instruct the patient to count the fingers of each hand while looking straight ahead.
5. Test all four quadrants for each eye. Patients with full visual fields should be able to count fingers in all four quadrants (recorded as "visual fields full to confrontation testing").

APPENDIX 2

The Nontraumatic Red Eye: Differential Diagnosis

	CONJUNCTIVITIS	IRITIS	KERATITIS (CORNEAL INFLAMMATION OR INFECTION)	ACUTE ANGLE-CLOSURE GLAUCOMA*
VISION	Normal or intermittent blurring that clears on blinking	Slightly blurred	Slightly or moderately blurred	Marked blurring
DISCHARGE	Usually significant with crusting of lashes	None	None to mild	None
PAIN	None or minor and superficial	Moderately severe; dull aching with photophobia	Sharp, severe foreign-body sensation	Very severe; frequent nausea and vomiting
PUPIL SIZE	Normal	Constricted	Normal or constricted	Dilated (moderately)
PUPILLARY RESPONSE TO LIGHT	Normal	Minimal further constriction	Normal	Minimal or no reaction of dilated pupil
INTRAOCULAR PRESSURE	Normal. Caution: Do not measure if discharge is present	Normal to low	Normal	Elevated
CORNEAL APPEARANCE	Clear	Clear or slightly hazy	Opacification present; altered light reflex; positive fluorescein staining	Hazy; altered light reflex
ANTERIOR CHAMBER DEPTH	Normal	Normal	Normal	Shallow

*NOTE: An ophthalmologist should examine the patient during an acute angle-closure attack to confirm the diagnosis, because other diseases may masquerade as acute angle-closure glaucoma.

APPENDIX 3

Resources

Basic and Clinical Science Course, Section 8: *External Disease and Cornea.* San Francisco: American Academy of Ophthalmology; (updated annually).

Bradford, Cynthia A, ed: *Basic Ophthalmology for Medical Students and Primary Care Residents*. 8th ed. San Francisco: American Academy of Ophthalmology; 2004.

Kunimoti DY, Kanitkar KD, Makar M, Friedberg MA, Rapuano CJ, eds: *The Wills Eye Manual: Office and Emergency Room Diagnosis and Treatment of Eye Disease*. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2004.

Preventing Eye Injuries Brochure. San Francisco: American Academy of Ophthalmology; 2004.

The Eye Exam and Basic Ophthalmic Instruments (DVD). San Francisco: American Academy of Ophthalmology; 2007 (reviewed for currency).

Trobe, Jonathan D: *The Physician's Guide to Eye Care*. 2nd ed. San Francisco: American Academy of Ophthalmology; 2001.