Resource Document 13: Ocular Trauma

(Optional Lecture)

Objectives:

Upon completion of this topic, the physician will be able to:

A. Obtain patient and event histories.

B. Perform a systematic examination of the orbit and its contents.

C. Identify and discuss those eyelid injuries that can be treated by the primary care physician, and those that must be referred to an ophthalmologist for treatment.

D. Discuss how to examine the eye for a foreign body, and how to remove superficial foreign bodies to prevent further injury.

E. Identify a corneal abrasion, and discuss its management.

F. Identify a hyphema, and discuss the initial management and necessity for referral to an ophthalmologist.

G. Identify those eye injuries requiring referral to an ophthalmologist.

H. Identify a ruptured globe injury, and discuss the initial management required prior to referral to an ophthalmologist.

I. Evaluate and treat eye injuries resulting from chemicals.

J. Evaluate a patient with an orbital fracture, and discuss the initial management and necessity for referral.

K. Identify a retrobulbar hematoma, and discuss the necessity for immediate referral.

I. Introduction

The initial assessment of a patient with ocular injury requires a systematic approach. The physical examination should proceed in an organized, step-by-step manner, and does not require extensive, complicated instrumentation in the multiple-trauma setting. Simple therapeutic measures often can save the patient's vision and prevent severe sequelae before an ophthalmologist is available. This optional lecture provides that pertinent information about early identification and treatment of ocular injuries that enhances the physician's basic knowledge and may save the patient's sight.
II. Assessment

A. History

Obtain a history of any pre-existing ocular disease.

1. Does the patient wear corrective lenses?
2. Is there a history of glaucoma?
3. What medications does the patient use, ie, pilocarpine?

B. Injury Incident

Obtain a detailed description of the circumstances surrounding the injury. This information often raises the index of suspicion for certain potential injuries and their sequelae, ie, the higher risk of infection from certain foreign bodies - wood versus metallic.

1. Was there blunt trauma?
2. Was there penetrating injury? In motor vehicular crashes there is potential for glass or metallic foreign bodies.
3. Was there a missile injury?
4. Was there a possible thermal, chemical, or flash burn?

C. Initial Symptoms/Complaint

1. What were the patient's initial symptoms?
2. Did the patient complain of pain or photophobia?
3. Was there an immediate decrease in vision that has remained stable or is it progressive?

The physical examination must be systematic so that function as well as anatomic structures are evaluated. As with injuries to other organ systems, the pathology also may evolve with time, and the patient must be periodically re-evaluated. A directed approach to the ocular examination, beginning with the most external structures in an "outside-to-inside" manner, ensures that injuries will not be missed.

D. Visual Acuity

Visual acuity is evaluated first by any means possible and recorded, eg, patient counting fingers at three feet.

E. Eyelids

The most external structures to be examined are the eyelids. The eyelids should be assessed for the following: (1) edema; (2) ecchymosis; (3) evidence of burns or chemical injury; (4) laceration(s) - medial, lateral, lid margin, canaliculi; (5) ptosis; (6) foreign bodies that contact
the globe; and (7) avulsion of the canthal tendon.

F. Orbital Rim

Gently palpate the orbital rim for a step-off deformity and crepitus. Subcutaneous emphysema may result from a fracture of the medial orbit into the ethmoids or a fracture of the orbital floor into the maxillary antrum.

G. Globe

The eyelids should be retracted to examine the globe without applying pressure to the globe. The globe is then assessed anteriorly for displacement resulting from a retrobulbar hematoma and for posterior or inferior displacement due to a fracture of the orbit. The globes also are assessed for normal ocular movement, diplopia at the extremes of the patient's gaze, and evidence of entrapment.

H. Pupil

The pupils are assessed for roundness with regular shape, equality, and reaction to light stimulus.

I. Cornea

The cornea is assessed for opacity, ulceration, and foreign bodies. Fluorescein and a blue light facilitate this assessment.

J. Conjunctiva

The conjunctivae are assessed for chemosis, subconjunctival emphysema (indicating probable fracture of the orbit into the ethmoid or maxillary sinus), subconjunctival hemorrhage, and nonimpaled foreign bodies.

K. Anterior Chamber

Examine the anterior chamber for a hyphema (blood in the anterior chamber). The depth of the anterior chamber can be assessed by shining a light into the eye from the lateral aspect of the eye. If the light does not illuminate the entire surface of the iris, a shallow anterior chamber should be suspected. A shallow anterior chamber may result from an anterior penetrating wound. A deep anterior chamber may result from a posterior penetrating wound of the globe.

L. Iris

The iris should be regular in shape and reactive. Assess the iris for iridodialysis, a tear of the iris or iridodensis, and a floppy or tremulous iris.
M. Lens

The lens should be transparent. Assess the lens for possible anterior displacement into the anterior chamber, partial discoloration with displacement into the posterior chamber, and dislocation into the vitreous.

N. Vitreous

The vitreous also should be transparent, allowing for easy visualization of the fundus and retina. Visualization may be difficult if vitreous hemorrhage has occurred. In this situation, a black rather than red reflex is seen by ophthalmoscopy. A vitreous bleed usually indicates a significant underlying ocular injury. The vitreous also should be assessed for an intraocular foreign body.

O. Retina

The retina is examined for hemorrhage, possible tears, or detachment. A detached retina is opalescent, and the blood columns are darker.

III. Specific Injuries

A. Lid

Lid injuries often result in marked ecchymosis, making examination of the globe difficult. However, a more serious injury to the underlying structures must be ruled out. Look beneath the lid as well to rule out damage to the globe. Lid retractors should be used if necessary to forcibly open the eye to inspect the globe. Ptosis may be secondary to edema, damage to the levator palpebrae, or oculomotor nerve injury.

Lacerations of the upper lid that are horizontal, superficial, and do not involve the levator may be closed by the examining physician using fine (6-0 to 8-0 silk) sutures. The physician also should examine the eye beneath the lid to rule out damage to the globe.

Lid injuries to be treated by an ophthalmologist include: (1) wounds involving the medial canthus that may have damaged the medial canaliculus; (2) injury to the lacrimal sac or nasal lacrimal duct, which can lead to obstruction if not properly repaired; (3) deep horizontal lacerations of the upper lid that may involve the levator and result in ptosis if not repaired correctly; and (4) lacerations of the lid margin that are difficult to close and may lead to notching, entropion, or ectropion.

Foreign bodies of the lid result in profuse tearing, pain, and a foreign-body sensation that increases with lid movement. The conjunctiva should be injected, and the upper and lower lids should be everted to examine the inner surface. Topical anesthetic drops may be used, but only for initial examination and removal of the foreign body.
Impaled, penetrating foreign bodies are not disturbed and are removed only in the operating room by an ophthalmologist or appropriate specialist. If the patient requires transport to another facility for treatment of this injury or others, apply a dressing about the foreign body to stabilize it.

B. Cornea

Corneal abrasions result in pain, foreign body sensation, photophobia, decreasing visual acuity, and chemosis. The injured epithelium stains with fluorescein.

Corneal foreign bodies sometimes can be removed with irrigation. However, if the foreign body is embedded, the patient should be referred. Corneal foreign bodies are treated with antibiotic drops or ointment (e.g., sulfacetamide or neomycin combination, bacitracin, or polymyxin). The eye should then be patched to prevent movement, minimize pain, and promote faster healing in the case of an abrasion or prevent further injury if there is an embedded foreign body. Patients with embedded foreign bodies should be referred to an opthalmologist.

C. Anterior Chamber

Hyphema is blood in the anterior chamber that may be difficult to see if there is only a small amount of blood. In extreme cases, the entire anterior chamber is filled. The hyphema can often be seen with a pen light. Hyphema usually indicates severe intraocular trauma.

Glaucoma develops in 7% of patients with hyphema. Corneal staining also may occur. Remember, hyphema may be the result of serious underlying ocular injury. Even in the case of a small bleed, spontaneous rebleeding often occurs within the first five days, which may lead to total hyphema. Therefore, the patient must be referred. Both eyes are patched, the patient is usually hospitalized, placed at bed rest, and re-evaluated frequently. Pain after hyphema usually indicates rebleeding and/or acute glaucoma.

D. Iris

Contusion injuries of the iris may cause traumatic mydriasis or miosis. There may be a disruption of the iris from the ciliary body, causing an irregular pupil and hyphema.

E. Lens

Contusion of the lens may lead to later opacification. Blunt trauma can cause a break of the zonular fibers that encircle the lens and anchor it to the ciliary body. This results in subluxation of the lens, possibly into the anterior chamber, causing a shallow chamber and acute, closed-angle glaucoma. In cases of posterior subluxation, the anterior chamber deepens. Patients with this injury should be referred to an opthalmologist.
F. Vitreous

Blunt trauma also can lead to vitreous hemorrhage. This is usually secondary to retinal vessel damage and bleeding into the vitreous, resulting in a sudden, profound visual loss. Funduscopic examination may be impossible, and the red reflex, seen with an ophthalmoscope light, is lost. A patient with this injury should be placed at bed rest with binocular patches and referred to an ophthalmologist.

G. Retina

Blunt trauma also causes retinal hemorrhage. The patient may or may not have decreased visual acuity, depending on involvement of the macula. Superficial retinal hemorrhages appear cherry red in color; the deeper lesions appear grey.

Retinal edema and detachment can occur with head trauma. A white, cloudy discoloration is observed. Retinal detachments appear "curtain-like." If the macula is involved, visual acuity is affected. An acute retinal tear usually occurs in conjunction with blunt trauma to an eye with a pre-existing vitreoretinal pathology. Retinal detachment most often occurs as a late sequela of blunt trauma. The patient describes light flashes and a curtain-like defect in peripheral vision.

A rupture of the choroid (blood supply to the retina) initially appears as a beige area at the posterior pole. Later it becomes a yellow-white scar. If it transects the macula, vision is seriously and permanently impaired.

H. Globe

A patient with a ruptured globe has marked visual impairment. The eye is soft due to a decreased intraocular pressure, and the anterior chamber is flattened or shallow. If the rupture is anterior, ocular contents may be seen extruding from the eye.

The goal of initial management of the ruptured globe is to protect the eye from any additional damage. A sterile dressing and eye shield should be applied carefully to prevent any pressure to the eye that may cause further extrusion of the ocular contents. The patient should be instructed not to squeeze his eye shut. If not contraindicated by other injuries, the patient may be sedated while awaiting transport or treatment. Do not remove foreign objects, tissue, or clots before dressing placement. No topical analgesics are used - only oral or parenteral, if not contraindicated by any other injuries.

An intraocular foreign body should be suspected if the patient complains of sudden sharp pain with a decrease in visual acuity. Inspect the surface of the globe carefully for any small lacerations and possible sites of entry. These may be difficult to find. In the anterior chamber, tiny foreign bodies may be hidden by blood or in the crypts of the iris. A tiny iris perforation may be impossible to see directly, but with a pen light the red reflex may be detected through the defect (if the lens and vitreous are not opaque).
I. Chemical Injuries

Chemical injuries require immediate intervention if sight is to be preserved. Acid precipitates proteins in the tissue and sets up somewhat of a natural barrier against extensive tissue penetration. However, alkali combines with lipids in the cell membrane, leading to disruption of the cell membranes, rapid penetration of the caustic agent, and extensive tissue destruction. Chemical injury of the cornea causes disruption of stromal mucopolysaccharides, leading to opacification.

The treatment is copious and continuous irrigation. Attempts should not be made to neutralize the agent. Intravenous solutions (sterile saline or Ringer's lactate) and tubing can be used to improvise continuous irrigation. Blepharospasm is extensive, and the lids must be manually opened during irrigation. Analgesics and sedation should be used, if not contraindicated by coexisting injuries.

Thermal injuries usually occur to the lids only and rarely involve the cornea. However, burns of the globe occasionally occur. A sterile dressing should be applied and the patient referred to an ophthalmologist. Exposure of the cornea must be prevented or it can perforate, and the eye can be lost.

J. Fracture

Blunt trauma to the orbit causes rapid compression of the tissues and increased pressure within the orbit. The weakest point is the orbital floor, which fractures, allowing the periorbital fat and possibly the inferior rectus and/or inferior oblique muscles to herniate into the antrum - hence the term, "blow out" fracture.

Clinically the patient presents with pain, swelling, and ecchymosis of the lids and periorbital tissues. There may be subconjunctival hemorrhage. Facial asymmetry and possibly enophthalmus might be evident or masked by surrounding edema. Limitation of ocular motion and diplopia secondary to edema or entrapment of extraocular muscles may be noted. Palpation of the infraorbital rim often reveals a step-off. Subcutaneous and/or subconjunctival emphysema can occur when the fracture is into the ethmoid or maxillary sinuses. Hypoesthesia of the cheek occurs secondary to injury of the infraorbital nerve.

The Waters view and Caldwell view (straight on) are very helpful for evaluating orbital fractures. Examine the orbital floor, and look for soft tissue density in the maxillary sinus or an air fluid level (blood). Computed tomographic scans also are helpful and may be considered mandatory.

Exophthalmometry must be performed as soon as possible. Treatment of fractures may be delayed up to a week. If entrapment is suspected, a forced duction test should be performed. (The inferior rectus is grasped with a forceps to test for entrapment.) Watchful waiting has avoided unnecessary surgery by allowing the edema to decrease, allowing more accurate
evaluation of the cosmetic or functional deficit.

K. Retrobulbar Hematoma

A retrobulbar hematoma requires immediate treatment by an ophthalmologist. The resulting increased pressure within the orbit compromises the blood supply to the retina and optic nerve, resulting in blindness if not treated.

L. Fat Emboli

Patients with long-bone fractures are at risk for fat emboli. Remember, this is a possible cause of a sudden change in vision for a patient who has sustained multiple injuries.

IV. Summary

Thorough, systematic evaluation of the injured eye results in few significant injuries being missed. Once the injuries have been identified, treat the eye injury using simple measures, prevent further damage, and help preserve sight until the patient is in the ophthalmologist's care.