AMERICAN COLLEGE OF EMERGENCY PHYSICIANS
SCIENTIFIC ASSEMBLY
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Case Studies in Nontraumatic Ophthalmologic Emergencies: Diagnosis and Management

Let this course sharpen your vision on the evaluation and treatment of ophthalmologic emergencies by starting with an in-depth understanding of ocular anatomy and physiology. Expert faculty will use case studies to illustrate the management of ophthalmologic problems in the emergency department. Common and uncommon entities will be reviewed. Techniques and methods of evaluation will be illustrated.

- Describe the eye anatomy and the pathophysiology of common ocular disorders.
- Discuss the diagnostic approach and management of common nontraumatic ophthalmologic emergencies.
- Describe the differential diagnosis of patients presenting with a painful red eye.
- Describe the approach to the treatment of acute glaucoma.

MO-44
Monday, October 11, 1999
3:00 PM - 4:55 PM
Room # N223
Las Vegas Convention Center

FACULTY

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Educational Objectives

1. Describe the eye anatomy and the pathophysiology of common and important non-traumatic ocular disorders.
2. Discuss the diagnostic approach and management of common non-traumatic ophthalmologic presentations and emergencies.
3. Describe the DDx of patients presenting with a painful red eye.
4. Describe the approach to treating acute glaucoma
5. List ocular complications of selected systemic diseases, i.e. hypertension, diabetes.

Outline

I. Selected Anatomy

A. Globe - Uveal tract: iris, ciliary body, choroid. Ora serrata/optic disk - retinal attachment
B. Cornea - Six layers including tears, very sensitive, site of numerous non-trauma problems.
C. Iris - vascular, dilator/constrictor muscles. Site of deep inflammatory problems.
D. Vascular supply - dual supply to globe, ophthalmic artery and vein traverse optic tract meningeal layers
E. Retina - 11 layers, basically, Neural layer/Rods and cones/Bruch's membrane/RPE/Choroid
F. Neuro-ophth - Edinger - Westphal nucleus is parasympathetic connector of CNIII.

II. Materials/Medications for Eye Exam in Emergency Department

A. Materials

1. Eye charts
2. Blank/pinhole eye occluder
3. Eye pads/shield
4. Lid elevator (Desmarres retractor)
5. Spud/Burr
6. Fluorescein Strips/U-V light
7. Light/magnifying sources
8. Schiotz or other tonometer

B. Medications

1. Mydriatics (only): 2.5% phenylephrine - dilates in 15-30 minutes, lasts 2-3 hours: Avoid higher concentrations. 1% hydroxyamphetamine -dilates in IO-15 minutes, lasts 1-2 hours.
3. Mydriatic/Cycloplegics (red tops): Homatropine probably best in ED, dilates in 30 minutes, duration up to 2-3 days. Dependent on iris pigmentation, light=longer. Scopolamine/Atropine last over one week and have no place in ED.
3 Myotics (green tops): .5-4% Pilocarpine, a parasympathomimetic, constricts in 20-30 minutes, duration 4-6 hours. Can be used in Ddx of "blown" pupil. Peripheral blockage/injury will not constrict. Central source (III N compression will constrict).
4. Anesthetics: Proparacaine HC1 0.5%. Lasts l-2 hours, consider protective patching. May be used in evaluation as relief of pain suggests surface injury. Avoid Tetracaine.

5. Antibiotics: Sulfa or Bacitracin-Polymyxin B (Polysporin) usually sufficient. ointments in potential penetration. Must question exactly what is being treated, since many complications viral or fungal.
6. Steroids- mentioned to stress NEVER to use without ophthalmologic consultation.
7. Antifungal - topical may be combined with systemic. Use after consultation. Examples: Idoxiuridine 0.1% - H. Simplex, Trifluxidine 1% - Adenovirus. H. Simplex.

III. History/Physical Examination

A. History

1. Usually pain, redness, or loss of vision
2. Associated signs and symptoms:
   a. Blurred vision - more serious if doesn't improve with blinking (renewal of tear layer)
   b. Pain - review location, character, worse/better, assoc. symptoms. Deep throbbing, or with eye movement more significant than scratching
   c. Photophobia -primarily associated with iritis or keratitis
   d. Diplopia - usually associated strabismus, but severe astigmatism can cause monocular (rare)
   e. Flashing lights/curtains - associated with retinal detachment
   f. Blackouts/greyouts - more central in origin
3. Review eye background: glasses/contacts, medication, previous injury.
4. General medical/surgical history.

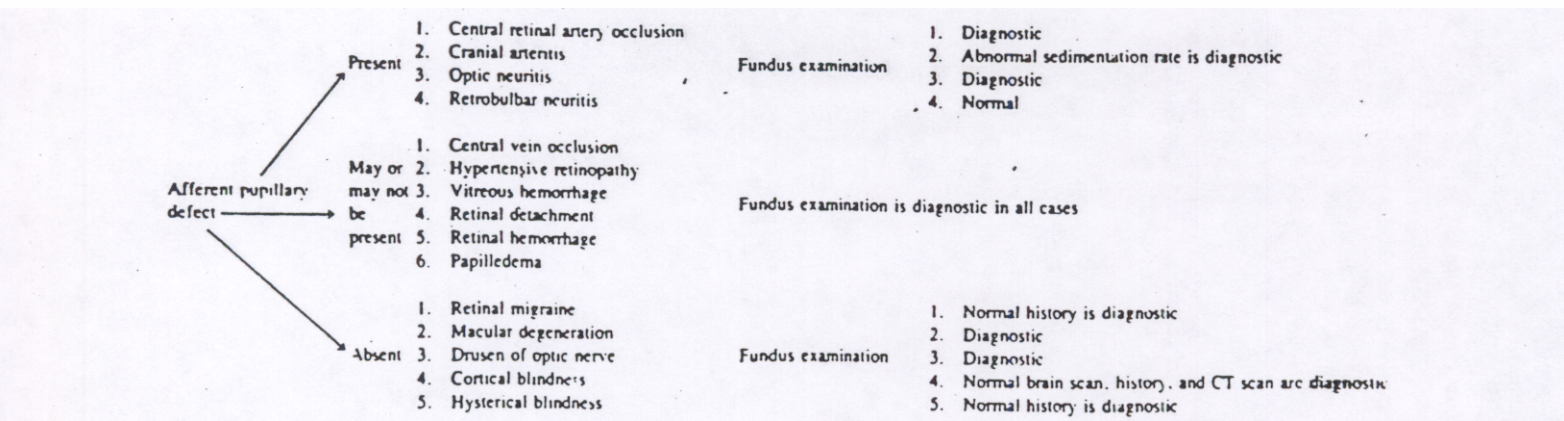
B. Physical Examination

1. Early and accurate visual acuity testing an absolute necessity. Vital signs of the eye.

VISUAL IMPAIRMENT	VISUAL DISABILITY
20/12 to 20/25	NORMAL VISION Healthy young adults average better than 20/20 acuity
20/30 to 20/70	NEAR-NORMAL VISION Causes no serious problems, but should be explored for potential improvement or possible early disease
20/80 to 20/160	MODERATE LOW VISION Strong reading glasses or magnifiers usually provide adequate reading speed
20/200 to 20/400 or CF 10 ft	SEVERE LOW VISION ("legal blindness" in USA) Gross orientation and mobility generally adequate, but difficulty with traffic signs, bus numbers, etc Reading requires high power magnifiers. Reading speed and endurance reduced
CF 8 a to CF 4 ft	PROFOUND LOW VISION Increasing problems with visual orientation and mobility. Long cane useful to explore the environment Highly motivated and persistent individuals can read visually with extreme magnification. Others rely on nonvisual means: braille, talking books, radio
less than CF 4 ft	NEAR-BLINDNESS Vision unreliable, except under ideal circumstances Must rely on nonvisual aids
NLP	TOTAL BLINDNESS No light perception Must rely on other senses entirely

2. Altered acuity may result from uncorrected refractive error, opacification of light-transition media, or alteration of light receiving/impulse transmitting neural structures.
3. External exam: consistent order to avoid missing a step
   Orbital bones, infra-orbital n., lids and margins, globe position/ condition, corneal clarity/light reflex, anterior chamber clarity/depth, iris structure and function, pupillary reflexes, ocular motility, direct ophthalmoscopy, visual fields.
4. Marcus-Gunn pupillary reflex (RAPD)
   Important to detect lesions ofprechiasmal afferents (retina, optic nerve). When normal eye illuminated, see direct and consensual constriction, then swing light over to injured eye and see dilation.

C. Altered visual acuity - examine 4 areas:
   1. Visual acuity
   2. Assess refractive component of visual acuity
   3. View transparency of visual axis
   4. Assess Marcus-Gunn pupil (prechiasmal afferent status)
      a. Relative afferent pupillary defect (RAPD)
         Present: Retina1 retachment, papilledema, optic nerve contusion, posterior pole hemorrhage, HTN retinopathy
         Absent: Migraine headache, muscular degeneration, cortical/hysterical blindness



D. Adjuncts to examination
   1. Fluorescein strips and U-V light
   2. Schiotz tonometer
   3. Imaging - radiography and tomography, ultra-sound, CT scanning. (discussed in trauma)

IV. Triage

A. Emergent

1. Caustic contamination
2. No visual perception
3. Progressive visual decrease
4. Abnormal globe shape or position
5. Cloudy cornea or anterior chamber

B Urgent

1. Foreign body complaint but eye grossly normal, except some infection and tearing.
2. Significant pain without visual changes or other problems.
3. Cannot fully look at eye due to blepharospasm, but no other reason to make emergent.

V. Non-traumatic Red Eye

A. External lesions - lids/lashes/lacrimal/periorbit

B. Conjunctival lesions

1. Pinguecula / Pterygium
2. Subconjunctival hemorrhage - Lasts 3-4 wks, evolution of reabsorbtion
3. Conjunctivitis: Allergic/Vernal, Bacterial / Viral - each with different treatment
4. Vascular abnormalities
5. Episcleritis (self limiting inflammation) /Nodular scleritis (serious inflammatory disorder)
6. Carcinoma - for awareness

C. Corneal lesions

1. Superficial punctate keratitis - caused by variety superficial insults, e.g. dry eye
2. Herpetic lesions - H. simplex. TX. Antiviral, after consult. May require systemic meds.
3. Ulceration

D. Iritis/Anterior Uveitis

1. Miotic pupil decreased vision. photophobia. normal IOP, "ciliary flush". Can induce pain in affected eye with light to unaffected eye. Look for flare on SLE

2. Wide DDx in Acute -Axial inflammatories, post-op. H. simplex (zoster),

Lyme disease, Bechet's. Chronic forms - either granulomatous (sarcoid, TB, syphillis) or nongranulomatous (JRA)

3. "Pseudo" form exists assoc. with phenothiazine toxicity, syphilis,congenital rubella.

4. Treat - cycloplegic, topical steroid, consider secondary glaucoma, treat underlying disorder.

E. Acute Glaucoma and medical approach for any ↑ IOP cause

1. Head elevation to 30', improves venous drainage
2. Pilocarpine 1% - Increase aqueous humor drainage, parasympathomimetic
3. Beta-Adrenergic Blockade (Timolol 0.5% Dorzolamide) - decrease aqueous humor production, beta-blockade.
4. Carbonic Anhydrase Inhibitor Acetazolamide - decrease aqueous humor production
   Hyper osmotic agents (1 gm/kg 20% Mannitol, 1 gm/kg 75% Glycerol) - dehydrating aqueous humor by creating blood-ocular osmotic gradient

F. Clues to causes of red eye

Signs	Acute glaucoma	Acute iridocyclitis	Keratitis	Bacterial conjunctivitis	Viral conjunctivitis	Allergic conjunctivitis
Ciliary flush*	+	++	+++	0	0	0
Conjunctival injection*	++	++	++	+++	++	+
Corneal haze*	+++	0	+ to +++	0	0,+	0
Pupillary*	middilated nonreactive	small, ± irregular	normal or	normal	normal	normal
Anterior chamber depth*	shallow	normal	normal	normal	normal	normal
Intraocular pressure*	high	usually low	normal	normal	normal	normal
Discharge	0	0	±	++ or +++	++	+
Preauricular node	0	0	0	0	+	0
Symptoms						
Blurred vision*	+++	+ to ++	+++	0	0	0
Pain*	++ to +++	++	++	0	0	0
Photophobia*	+	+++	+++	0	0	0
Halo*	++	0	0	0	0	0
Mattering	0	0	0 to +++	+++	++	+
Itching	0	0	0	0	0	++
Head cold fever	0	0	0	0	0,++	0

VI. Fundus Examination

A. Vitreous - Retina most clearly focused at +1 to -1. Optic disc is central reference point, bisecting line demarcates nasal and temporal fundus.

B. Normal/Variants - Examine Optic disc (color, cup size, margins), Vessel (caliber, color contour, crossings) Retina, Macula (last). Variants are primarily pigmentation differences.

C. Vascular - Hemorrhage - can occur 3 levels: pre-retinal, intra-retinal, choroidal.

D. Vascular - Emboli/Occlusions

1 Artery - true ocular emergency. 30-60' before permanent damage. Try up to 2° Tx: Vasodilation (bag breathing), ocular pressure release. Often discovered "after the fact".

2 Venous - Branch or central commonly at A-V crossing. Seen in HTN, DM, Hyperviscosity syndromes.

E. Retinal breaks / detachment-may be spontaneous, assoc. with DM, post I-O bleed

F. Retinal degeneration

1. Angioid streaks -Usually asymptomatic, 50% assoc. with a systemic disease - PXE, Paget's, Sickle Cell, Ehlers-Danlos
2. Drusen - Small yellow-white spots deep to retina
3. Retinitis pigmentosa - Hereditary dystrophy of retinal receptors. Spiculated pigment. Early change is night vision.

G Retinal infection - AIDS - CMV, histoplasmosis, fungal

H Optic Disc - hyperemia, papillitis, papilledema, ischemia, atrophy

Indication	Paoilledema	Papillitis
Visual acuity	Normal	Decreased
Visual field	Enlarged blind spot	Central scotoma
Venous pulsations	Absent	Present
Pain on eye motion	Absent	Present
Disc elevation	May be >2D	<2D

1. Macular Disorders - degeneration, inflammation, vascular. trauma. General prognosis of degeneration/injury is poor.

VII. Hypertension - Fundus

A. A vascular sequence representing severity over time. Prognostically 5 yr survival of Stage I > 70%, Stage IV - 1%.

- I & II: Acute - spasm, Chronic - irregular caliber/thickening / "copper" wiring / A-V nicking

- III: Ischemia / hemorrhage / exudate / extensive microvascular changes

- IV: Papilledema, defines "malignant hypertension"

B. Treatment is directed toward HTN. Pre-exudative fundus recovers well

VIII. Diabetes - Fundus (Factor in 25% of new blindness in U.S.)

A Background retinopathy
- Leaks /hard exudates / micro aneurysms /micro infarcts (cotton wool exudates)

B. Proliferative retinopathy - more often and earlier in insulin dependent DM
- Neovascularization with fibrous proliferation. Fibrovascular membrane attaches to vitreous membrane. Vitreous traction causes intra-ocular hemorrhage and/or retinal detachment.

C Obliterative retinopathy
- Hemorrhage / scarring
- Retraction / detachment

References:

1. "Emergency Treatment of the Eye", Scott JL, Ghezzi KT, Emergency Medical Clinics of North America 13:13, 8/95. (Well-done EM oriented eye review)
2. Ophthalmology for Medical Students & Primary Care Physicians, 6th edition, American Academy of Ophthalmology, 655 Beach, Suite 300, San Francisco, CA 94109-1336, 1993. (An excellent primer on the eye evaluation, contains color photos of eye lesions, excellent references.
3. ACEP Ophthalmology Study Guide (Well done in conjunction with Ophthalmology, useful information but weak in trauma).
4. The Wills Eye Manual, 2nd Ed., Cullom and Chang, Philadelphia, J.B. Lippincott, 1994. (Best text for ED)
5. CD - Atlas of Opthalmology, Ford and Marsh, St. Louis, Mosby. 1998. $285 (From London, well done, complete eye images. Have department or library purchase),

TWENTY-TWO UNFORGETTABLE OPHTHALMIC FACTS

Borrowed from Drs. Roland and Clark
(Previous Eye Topic presenters at ACEP)

1. Never give Ophthaine as an outpatient treatment.
2. 1% Paredine is the drug of choice for emergency dilation of the pupils. It is easily reversible with 1% Pilocarpine.
3. Neosporin - the most sensitizing topical antibiotic to the eye.
4. Use sulfa or chloromycetin eye drops for routine conjunctivitis.
5. Have patient wear glasses when taking visual acuity.
6. With severe trauma, immediate treatment consists of placing the patient in a supine position with eye shields over the injured eye.
7. Do not use steroids unless consult and patient will see an ophthalmologist within 36 hours.
8. A topical anesthetic will differentiate superficial (corneal) from deep origin eye pain.
9. Arc Welder's flash - use 1 drop of ophthaine, ointment and cycloplegic and many patch both eyes.
10. Subconjunctival hemorrhage - be sure to rule out a foreign body.
11. A semi-diagnostic test for iritis is 1 drop of 1% Mydriacyl should relieve about 50% of the pain in about 10 minutes. Also light shined in unaffected eye causing pain in other one.
12. When at a loss about what to do with a patient with a conceivable severe eye injury, place them on their back, put patches gently over eyes and let them rest.
13. A retinal tear or dislocated it-ma-ocular lens would be treated as #12.
14. A lid laceration that goes through the lid margin or canaliculus should be repaired by an ophthalmologist.
15. With any black eye - don't forget a blow-out fracture.
16. If you even think of an intraocular foreign body, get a soft tissue x-ray of the globe.
17. There are only two true emergencies involving the eye:
    1. Central retinal artery occlusion
    2. Chemical burn
18. Optic neuritis looks very similar to papilledema but the former is:
    a. Unilateral
    b. Associated with a moderate to marked decrease in vision
    c. Has a large central scotoma
    d. Has minimal retinal hemorrhages or venous congestion.
19. If the visual acuity is 20/25 or better with glasses in both eyes and the pupils are equal and react to light and accommodation and the fundus looks ok, there is probably nothing serious going on.
20. Light sensitivity is a non-specific symptom of virtually any ocular irritation.
21. . Most superficial ocular infections, corneal abrasions, and mild trauma will clear no matter what topical treatment you use.
22. Do not use ointment if
    a. There is any chance of penetrating trauma (the ointment may get into the anterior chamber)
    b. When fundus examination is required in the next several hours (ointment will mechanically obscure the view).