Ophthalmology for the Generalist

The Red Eye
Acute Conditions

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Preview

- How the eye works
- The red eye
- Acute eye conditions
- Basic eye exam
- Chronic vision loss
How the eye works
The red eye
Acute eye conditions
Basic eye exam
Chronic vision loss
Useful references

- Website: The Eyes Have It
  - http://www.kellogg.umich.edu/theeyeshaveit/

- The Physician's Guide to Eye Care, Jonathon Trobe, AAO
- How the eye works
- The red eye
- Acute eye conditions
- Eye exam
- Chronic vision loss
How the eye works

- Front part collects light
- Light is refracted by two surfaces
  - Cornea
  - Lens
- Back part forms the image and sends it to the brain
Light path

- Cornea
- Anterior chamber
  - aqueous humor
- Pupil
- Lens
- Vitreous humor
- Retina
Anterior segment

- Lids
- Conjunctiva/sclera
- Cornea
- Anterior chamber
- Iris
- Lens
Posterior segment

- Vitreous
- Optic disk
- Vessels
- Retina
  - Macula
  - Periphery
- Choroid
- How the eye works
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The Red Eye

- Red
  - Eyelid or eyeball?
  - Where is it red?
  - Why is eyeball red?

- Pain
  - Foreign-body sensation?
  - Improve with anesthetic?

- Blurred vision
The Red Eye

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- Cornea
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- Blurred vision
Eye pain

- Ocular surface
  - Helped by anesthetic
  - Foreign-body sensation

- Intraocular
  - Photophobia
  - Ciliary flush

- Extraocular (orbit)
  - Pain with eye movements
  - Diplopia
Eye pain

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- **Eyelids**
  - Blepharitis
  - Stye / Chalazion
  - Dacryocystitis

- **Cornea**
  - Abrasion
  - Bacterial keratitis
  - Viral keratitis

- **Conjunctiva**
  - Dry eye syndrome
  - Allergic conjunctivitis
  - Viral conjunctivitis
  - Bacterial conjunctivitis
  - Pingueculitis
  - Pterygium
  - Subconjunctival hemorrhage
  - Episcleritis
  - Scleritis

- **Intraocular**
  - Acute glaucoma
  - Uveitis / Iritis
  - Endophthalmitis

- **Orbit**
  - Pre-septal cellulitis
  - Orbital cellulitis
  - C-C fistula
Eyelids

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Blepharitis

- Inflammation of eyelids

Presentation
- Red, thickened eyelids
- Crusting
- Gritty, burning

Treatment
- Warm compresses
- Antibiotic ointment
Stye/Chalazion

- Inflammation of lash follicle or oil gland
- Painful bump on eyelid

Treatment
- Warm compresses x 6 weeks
- May need excision/drainage
Dacryocystitis

- Inflammation of lacrimal sac
- Hot nodule next to nose
- Usually infection secondary to obstruction

**Treatment**
- Referral
- Systemic antibiotics
- I&D, Surgery
Cornea

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Corneal Abrasion

- Disruption of corneal epithelium
- Extremely painful foreign-body sensation
- Fluorescein staining
- Antibiotic ointment
  - +/- Pain meds
- No need to patch
Bacterial keratitis

- Infection of the cornea

**Presentation**
- Photophobia
- Foreign-body sensation
- Ciliary flush

**Treat**
- Quinolone drops (Cipro)
- Referral
Viral keratitis

- Herpetic infection of cornea
  - Simplex or Zoster

- Dendritic or geographic epithelial defect
  - +/- skin findings

- Referral
- Antivirals
  - Topical or systemic
Conjunctiva

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Dry Eye Syndrome

- Very, very common in NM

**Symptoms**
- Wind, smoke, reading, end of day
- Waxing/waning vision
  - Blinking or resting eyes helps
- Tearing

**Etiology**
- Inadequate tear production
  - Sjogren’s Syndrome
- Tear film instability

**Treatment**
- Lubricant eye drops (artificial tears)
- Warm compresses
- Flaxseed or fish oil
Allergic conjunctivitis

- Often seasonal
  - April and September
- Itchy
- Both eyes
- OTC: Ketotifen
  - Generic, Alaway, Zaditor
- RX:
  - Patanol
  - Cromolog
Bacterial conjunctivitis

- Rare and self-limited in adults
- Thick, yellowish discharge
- Treatment
  - Quinolone drops
- Refer if compromised host, significant vision loss, or no improvement in 3 days
Viral conjunctivitis

- Pink eye
- Adenovirus
- Discharge is clear or mucoid
- **Discharge is highly contagious**
- Contacts
  - Children
  - Other eye few days later
- Self-limited ~ 1 week
  - Hygiene – don’t rub
  - Quarantine
- Refer only if worsens
Pingueculitis

- Pinguecula is abundant conjunctival tissue
  - Nasal or temporal globe
  - Very common
  - Often unnoticed until surrounding tissues get inflamed
- Vision unaffected
- Treatment
  - OTC lubricant drops or vasoconstrictor
Pterygium

- Fibrovascular proliferation of palpebral conjunctiva
  - Usually nasal
  - Slow-growing
- Extends onto cornea
- Vascularity creates chronic redness
- Treatment – usually none
- Only cure is surgical excision
Subconjunctival Hemorrhage

- Blood between conjunctiva and sclera

- No vision changes

- Trauma (rubbing), sneezing, spontaneous

- No treatment
Episcleritis

- Focal inflammation of deep subconjunctival tissue
- Mild pain/redness
- Dilated vessels usually away from cornea
- Self-limited
- Lubricant eye drops
Scleritis

- Inflammation of sclera
  - Focal or diffuse

- Deep, severe pain

- Associated with collagen-vascular/auto-immune diseases

- Referral
  - Systemic meds
Intraocular

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- Viral keratitis
- Fungal keratitis

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Acute glaucoma

- Sudden increase in intraocular pressure (IOP)
- Red, pain, blurred vision, mid-dilated pupil
- Nauseous
- Emergency – hours count
- This is why you need to know how to check IOP
- Immediate treatment and referral
Uveitis / Iritis

- Inflammation inside eye
- Uveitis (iris, ciliary body, choroid)
- Photophobia
- Ciliary flush (near limbus)

Referral
- Steroids
- Work-up
Endophthalmitis

- Infection inside eyeball
- Red, painful eye
- Hypopion

Sources
- Surgery
- Trauma
- Endogenous
Endogenous Endophthalmitis

Sources

- Endocarditis, GI, urinary tract, indwelling catheters

- If focal source, think bacterial

- If compromised host, think fungal
Candidal endophthalmitis progression (from Kanski atlas)

Choroiditis

Endophthalmitis Vitreal involvement

Risk of advancing to endophthalmitis if on anti-fungals is extremely low
Fungal Endophthalmitis Management

- Candidemia with eye or valve involvement receives a longer course of anti-fungals
- Anti-fungals
- Vitrectomy (especially if Aspergillus)
  - Culture
  - Ampho B
  - Recommended if substantial vision loss
Orbit

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Preseptal Cellulitis

- Peri-ocular skin infection
- Limited to the skin

- Systemic antibiotics
  - Cephalexin
Orbital Cellulitis

- Infection in the orbit
- Diplopia
- Admission
  - I-V antibiotics
  - Drain abscesses
Carotid-Cavernous sinus fistula

- A-V fistula
  - Carotid-Cavernous sinus
- Orbital vascular congestion
- Chronic redness from corkscrew vessels
- Whooshing sound in head
- Referral
  - Observe
  - Self-limited
  - Embolization
Red eye

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# Triage

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Acute eye conditions

- **Emergencies**
  - Alkali burn
  - Acute angle closure glaucoma
  - Central retinal artery occlusion (CRAO)
  - Ruptured globe

- **Urgencies**
  - Lid lac (marginal or canalicular)
  - Retinal detachment
  - Papilledema
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Chemical to eye

- All chemical exposures need to be rinsed immediately with
  
  **AT LEAST 2L saline**

  - More if suspect alkali
  - Alkali eats through cornea (acid doesn’t)
  - Must get pH under 8.0 (you’ll never get to 7.4)
Chemical to eye

- Severity of alkali burn is judged by
  - corneal opacification
  - size of epithelial defect,
  - limbal ischemia/whitening

- Airbag deployment can release alkali – check pH
Acute glaucoma

- This is why you have to know how to check IOP

- Eye pain, redness, tearing, blurring (cloudy cornea), mid-fixed pupil, *nausea*
Acute glaucoma

- Refer immediately
  - Give any available pressure-lowering meds (drops or diamox)
  - If secondary to orbital swelling (hematoma, CC-fistula), perform lateral canthotomy/cantholysis
    - Cut lateral eye corner and inferotemporal ligament
    - We can easily repair it later if needed
Central retinal artery occlusion

- Acute, painless loss of vision
- Exam shows whitening of retina with cherry-red macula
- Refer immediately
Ruptured globe

- Corneal or scleral full-thickness laceration
- Eye loses pressure and contents shift

**Signs**
- Obvious laceration
- Collapsed anterior chamber
- Irregular pupil
- Low pressure
- Irregular contour on CT
Ruptured globe

- If diagnosed/suspected:
  - NPO
  - Shield (metal shield or paper cup over eye)
    - NOT A PRESSURE PATCH
  - Anti-emetics
  - CT to r/o retained foreign body
- Goal is to avoid pressure changes within the eye
- Surgical priority is to restore integrity of the globe
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Eyelid lacerations

- Eyelid margin
  - Requires experienced closure to avoid notching
Eyelid lacerations

- Lacrimal canaliculus
  - Suspect if laceration involves eyelid margin between the lacrimal puncta and medial canthus
  - Requires OR, silicone stenting
Retinal detachment

- Retina separates from back of eye wall
- Symptoms are *flashes*, *floaters*, and *curtain* over part of vision
- Starts peripherally
- Requires surgery
Papilledema

- Optic disk edema *secondary to increased intracranial pressure*

- Not all disk edema is papilledema
Papilledema - findings

- Burred disk margins
- Obscured vessels
- Flame hemorrhages
- Bilateral
REVIEW
The Red Eye

- Red
  - Eyelid or eyeball?
  - Why is eyeball red?
  - Where is it red?

- Pain
  - Foreign-body sensation?
  - Improve with anesthetic?

- Blurred vision
Red Eye

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Primary treatments

- For dry eyes, use artificial tears and warm compresses
- For allergies, use ketotifen eyedrops
- For antibiotic, use a quinolone (Cipro)
- For ointment, use erythromycin
- Don’t give topical steroids
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Light path

- Cornea
- Anterior chamber/aqueous humor
- Pupil
- Lens
- Vitreous humor
- Retina
Eye Exam – components

- Visual acuity
- Visual fields
- Pupillary response
- Motility
- Intraocular pressure (IOP)

- Anterior segment
- Fundus examination

Form

Function
Visual acuity

- Measures central vision
- One eye at a time
- Force patient to miss at least half
  - They get credit for any line with at least half right
- Notation
  - Near (N) or Distance (D)
  - With (cc) or Without (sc) correction
  - Pinhole (PH)
- Must be reproducible
Visual fields

- Measures peripheral vision
- One eye at a time
- 1, 2, or 5 fingers in each quadrant while patient fixates on nose
- Notation: Visual fields full to confrontation (VFFTC OU)
Pupils

- Abnormalities represent dysfunction of the pupil mechanics or the Optic nerve
  - *The Optic nerve is the important one*
Afferent Pupillary Defect (APD)

- Swinging flashlight test
- Pupil *appears* to dilate in response to light
- Suggests Optic Nerve dysfunction

**TAKE HOME MESSAGE**
Afferent pupillary defect
Motility

- Both eyes open (have to hold lids)
- Six cardinal directions of gaze

Notation: Vergences full/conjugate
Intraocular pressure (IOP)

- Usual range 10-20 mm Hg
- You must know how to measure the eye pressure
- Can be measured with applanation or Tonopen

TAKE HOME MESSAGE
How to use the Tonopen

- Anesthetic drop
- New tip cover
  (always keep tip covered)
- Hold black button until beeps
- Ready to read when double black lines
- Hold lids if necessary
  - Against bone – don’t push on globe
How to use the Tonopen

- Tap perpendicular to center of cornea
  - Faint beep with each reading
- Long beep when readings satisfactory or times out
  - Should have <5% deviation (underscore on display)
- Will turn itself off

* If says CAL (needs calibration), hold pointing down for several seconds. When beeps “up”, point it up until it says “good”
Anterior segment is best examined with a slitlamp biomicroscope (slit lamp)
Anterior segment

- Lids
- Conjunctiva/sclera
- Cornea
Anterior segment - Cornea

- Fluorescein stains disrupted epithelium
  Use as LITTLE AS POSSIBLE
Anterior segment

- Lids
- Conjunctiva/sclera
- Cornea
- Anterior chamber
- Iris
- Lens
Structure

Posterior segment examined with an Ophthalmoscope
Direct Ophthalmoscope

- Illuminating aperture
- Collecting lenses
- Mirror
- Light source
- Examined eye
- Observing eye
Technique - Dilation

- Makes examination MUCH easier
- Red-top eydrops
  - Phenylephrine 2.5%
    - Stimulates iris dilator
  - Tropicamide 1%
    - Inhibits iris sphincter
  - Last 4-6 hours
- Contraindication: need to follow pupil exam
Technique

- Dilate
- Examiner and patient at eye level
- Patient +/- examiner remove eyeglasses
- Patient fixates in distance with other eye
- Index finger on focusing wheel
- To examine *right eye*
  - Hold in *right* hand
  - Look with *right* eye
Technique

- Set dial well into the black/green
- Look through aperture
- Focus to get a clear red reflex
  - You will need to dial counterclockwise
Technique

- Focus to get a clear red reflex
- You will need to dial *counterclockwise*

- Compare reflex in both eyes
- Dimness or opacifications represent problems in the light path (the visual axis)
Technique

After assessing the red reflex...

- Stand slightly lateral to patient
  - You’ll be looking toward the optic nerve head
- Move in toward patient
- Identify a retinal vessel
- Dial *counterclockwise* to bring vessel into focus
Technique

- Move as close as you can to the patient’s eye
  - Wider field of view
  - Less reflections

- Trace the vessel branching pattern back to their origin (optic disk)

Now you are ready to concentrate on the exam – no more adjustments
Exam - fundusscopic

Red reflex → Disk → Vessels → Background → Macula → Periphery
Red Reflex $\rightarrow$ Vitreous $\rightarrow$ Disk $\rightarrow$ Vessels $\rightarrow$ Background $\rightarrow$ Macula $\rightarrow$ Periphery

- Cup-to-disk ratio (CDR)
Cup-to-disk ratio

- The cup is the central portion of the nerve, corresponding to the region where the nerve fibers dive deep to exit the eyeball.
Cup to disk ratio

- Normal CDR is < 0.5
Red Reflex → Vitreous → Disk → Vessels → Background → Macula → Periphery

- Cup-to-disk ratio (CDR)
  - >0.5 suggests optic nerve damage

- Edema

- Pallor
Red Reflex → Vitreous → Disk → Vessels → Background → Macula → Periphery

- Vein:Artery diameter ratio should be 3:2
- A-V nicking
- Plaques/occlusions
Red Reflex → Vitreous → Disk → Vessels → Background → Macula → Periphery

Look for red or yellow spots
Red Reflex → Vitreous → Disk → Vessels → Background → Macula → Periphery

Look for red or yellow spots

- **Red spots**
  - Hemorrhages
    - Microhemorrhages (MH) or Dot-Blot Hemorrhages (DBH)
    - Aneurysms

- **Yellow spots**
  - Hard Exudates (HEx) - lipid deposits from leaking vessels
  - Cotton-wool spots (CWS) – infarction of nerve-fiber layer
  - Drusen – lipid deposits from poor metabolism (RPE dysfunction)

- **Whitening**
  - Commotio Retinae = retinal contusion
Macula is true center of posterior pole
  - Central vision

Temporal and a bit inferior to disk

Identified by:
  - Slightly darker
  - Absence of blood vessels
    - Foveal Avascular Zone
  - Very light sensitive
- Very difficult to see

- Nasal periphery sees the temporal visual field, inferior retina sees superior visual field, etc
Examination Tips

- Always examine/measure right eye first
  - Right is drawn first (left) or on top

- If the patient has eye pain, use anesthetic drops
  - Note how much it helps
    - Ocular surface pain is quite sensitive and responsive
    - Intraocular or orbital pain will be minimally responsive
Eye pain

- Ocular surface
  - Helped by anesthetic
  - Foreign-body sensation
- Intraocular
  - Photophobia
  - Ciliary flush
- Extraocular (orbit)
  - Pain with eye movements
  - Diplopia
Take home points

- Visual acuity is measured by the smallest line with at least half correct.

- An Afferent Pupillary Defect (APD) suggests Optic Nerve dysfunction.

- Know how to check pressure.

- Use as little fluorescein as possible.

- Use anesthetic to exam painful eyes.
- How the eye works
- The red eye
- Acute eye conditions
- Eye exam
- Chronic vision loss
Chronic vision loss

- Cataract
- Diabetic Retinopathy
- Macular Degeneration
- Glaucoma
Cataract

- Clouding of the lens
- Usually age-related
- Causes glare problems and blurred vision
- Only treatment is surgery (replacement)
Diabetic retinopathy

- Vasculopathy
- Clinically, yellow and red spots
- Hemorrhages, aneurysms, infarcts, neovascularization
- Ischemia, edema, hemorrhage
Diabetic retinopathy

- Two stages

  - Non-proliferative
    - Red and yellow spots

  - Proliferative
    - Neovascularization
      - Retina or iris
      - Serious complications
Macular Degeneration

- Age-related
- Degenerative process affecting retina, RPE, and choroid
- Yellow spots (drusen)
  - Lipoprotein deposits
Macular Degeneration

- Two stages
- Dry
  - Atrophic changes
- Wet
  - Choroidal neovascularization
  - Most of severe vision loss
Glaucoma

- Damage to optic nerve
  - Large cup-to-disk ratio

- Risk factors:
  - Increased intraocular pressure
    - Usual IOP 10-20 mm Hg
  - Age
  - Family history of glaucoma
Glaucoma

- Damage to optic nerve

- The P’s
  - Painless
  - Permanent
  - Progressive
  - Preventable
Glaucoma

**Normal**

CUP:DISC < 1:2

**Glaucoma**
REVIEW
Chronic visual loss

- Cataract - opacification of the natural lens

- Glaucoma - damage to the Optic Nerve
  - Progressive, Painless, Permanent, Preventable

- Diabetes in the eye is a retinal vascular disease
  - Non-proliferative and proliferative stages

- Macular Degeneration affects the central retina
  - Dry and wet stages
Chronic diseases

- Hypertension causes vessel changes
  - Arterial thinning and sheathing, venous nicking

- Diabetic retinopathy shows up as red or yellow spots

- Macular degeneration starts as yellow spots (drusen) in the macula
THANK YOU
Ophthalmology for the Internist

The Red Eye
Acute Conditions
Basic Eye Exam
Chronic Conditions

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University of New Mexico School of Medicine
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Useful references

- Website: The Eyes Have It
  - http://www.kellogg.umich.edu/theeyeshaveit/

- The Physician's Guide to Eye Care, Jonathon Trobe, AAO
The Red Eye

- Red
  - Eyelid or eyeball?
  - Why is eyeball red?
  - Where is it red?

- Pain
  - Foreign-body sensation?
  - Improve with anesthetic?

- Blurred vision
Red Eye

- Eyelids
  - Blepharitis
  - Stye / Chalazion
  - Dacryocystitis

- Cornea
  - Abrasion
  - Bacterial keratitis
  - Viral keratitis

- Conjunctiva
  - Dry eye syndrome
  - Allergic conjunctivitis
  - Viral conjunctivitis
  - Bacterial conjunctivitis
  - Pingueculitis
  - Pterygium
  - Subconjunctival hemorrhage
  - Episcleritis
  - Scleritis

- Intraocular
  - Acute glaucoma
  - Uveitis / Iritis
  - Endophthalmitis

- Orbit
  - Pre-septal cellulitis
  - Orbital cellulitis
  - C-C fistula
## Triage

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<tr>
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<th>REFERRAL Non-urgent</th>
<th>REFERRAL Urgent</th>
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<tr>
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<td>Stye</td>
<td>Episcleritis</td>
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<td>Presertal cellulitis</td>
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Primary treatments

- For dry eyes, use artificial tears and warm compresses
- For allergies, use ketotifen eyedrops
- For antibiotic, use a quinolone (Cipro)
- For ointment, use erythromycin
- Don’t give topical steroids
Acute eye conditions

Emergencies
- Alkali burn
- Acute angle closure glaucoma
- Central retinal artery occlusion (CRAO)
- Ruptured globe

Urgencies
- Lid lac (marginal or canalicular)
- Retinal detachment
- Papilledema
Acute eye conditions

- Flush all chemical exposures with at least 2L
- Acute glaucoma presents with nausea
- Papilledema is optic disk swelling secondary to increased intracranial pressure
Exam basics

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