

## Emergency Ophthalmology

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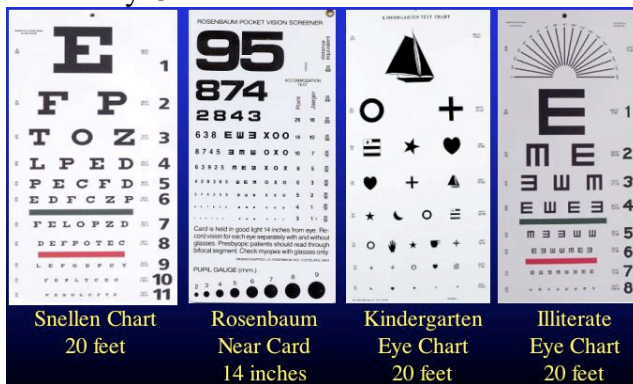
Handout can be found on [lbstack.com/students/eye-handout.pdf](http://lbstack.com/students/eye-handout.pdf)

### Summary Points:

1. Consult Ophthalmology if you can not account for change in visual acuity
2. Headache, decreased vision, fixed mid-position pupil and IOP > 21mmHg suggest glaucoma
3. Chemical injury to the eye should be irrigated until asymptomatic or until the pH is 7.0-7.4
4. Eye trauma and an IOP of <8 mm Hg suggests open globe and CT scan of orbits may confirm
5. APD after orbital trauma suggests traumatic optic neuropathy
6. Pain, epithelial defect, and corneal infiltrate suggests corneal ulcer and requires ophthalmology consult
7. Differentiation between orbital and pre-septal cellulitis requires a contrasted CT scan of the orbits
8. Hyphema complications include rebleeding, corneal staining, and increased IOP
9. Look for a foreign body under lids in anyone with corneal abrasion
10. Do not use topical ophthalmologic steroids in the emergency department

### Examination Components

1. Visual Acuity (Va) → Vital sign of the Eye
  - a. Best corrected (wear glasses if they have them)
  - b. Pinhole (PH) if worse than 20/70 → PH corrects refractive error
  - c. Acuity Charts



- d. Get credit for a line on the visual acuity chart if they are 50% correct
- e. If vision is worse than 20/200 ("E") move to 10 feet → 5 feet
- f. If vision is worse than 20/800, Count Fingers (CF) at 3 feet
- g. If unable to CF, check Hand Motion (HM) at 3 feet
- h. If unable to detect HM at 3 feet, establish Light Perception (LP)
- i. Evaluate the affected eye first
- j. Documentation convention

$Va^{20/20}$

Numerator – distance of the patient from the chart

Denominator – distance from which a person with normal vision would read the line with greater than 50% accuracy

- k. Visual Acuity continuum

Acuity	Comments
20/15	Excellent Vision
20/20	Normal Visual Acuity
20/40	Acceptable Vision for Driving
20/200	Legally Blind - Can't see "E"
Counting Fingers	CF
Hand Motion	HM
Light Perception	LP
No Light Perception	NLP

1. Situations where visual acuity should wait until after treatment
  - i. Chemical exposure → irrigate immediately
  - ii. Open globe → protect against orbital content loss
  - iii. Severe pain → treat pain
2. Pupillary examination → tests pupillary reflex arc
  - a. Size → should be 3-4mm in size and equal
    - i. 4% of population has 1mm difference in pupil size
    - ii. myosis → constricted pupil
      1. Horner's syndrome
      2. Argyll Robertson Pupil
      3. Inflammation of the iris
      4. Topical or Systemic cholinergic medications
      5. Narcotic overdose
      6. Pontine hemorrhage
    - iii. mydriasis → dilated pupil
      1. Optic nerve injury
      2. Brain herniation syndromes
      3. Traumatic mydriasis
      4. Adies (tonic) pupil
      5. Topical or systemic anticholinergic medications
      6. Topical or systemic adrenergics
  - b. Shape → should be symmetrically round
    - i. Synechiae → adhesions from lens to iris
    - ii. Open globe → tear drop shaped pupil
    - iii. Previous surgery → may alter shape of pupil
    - iv. Direct trauma → may cause elliptical shaped pupil
  - c. Light response
    - i. Direct
    - ii. Consensual → consensual photophobia suggests iritis
  - d. Accommodation → patient should fixate on your finger at a distance of 1 foot. The ability to accommodate is intact if pupillary constriction is evident as you move your finger closer to the patient.
  - e. Convention

PE  $\frac{4}{4} \frac{2}{2}$  RRLA

3. Afferent Pupillary Defect (APD) → Marcus-Gunn pupil
  - a. Swinging flashlight test → Shine light in the unaffected eye, the eye should elicit a direct and consensual pupillary constriction. When the light is shined into the affected eye there will be an abnormal apparent dilation of that eye.
    - i. Traumatic optic neuropathy
    - ii. Retinal detachment
    - iii. Vitreous bleed

- iv. Optic nerve injury
- v. Open angle glaucoma
- vi. Optic atrophy
- vii. Central retinal artery occlusion
- viii. Central retinal vein occlusion

b. APD in trauma patient could represent brain herniation or a traumatic optic neuropathy

4. ExtraOcular Motility Examination

- a. Orbital cellulitis
- b. Cranial nerve infarction → seen in patients with diabetes
- c. Orbital floor fracture with extrusion of orbital contents through the orbital floor
- d.

Extraocular muscle	Function	Innervation
Lateral rectus	Abduction	CNVI
Superior oblique	Abduction, depression, intortion	CN IV
Medical rectus	Adduction	CN III
Inferior rectus	Depression	CN III
Superior rectus	Elevation	CN III
Inferior oblique	Abduction, elevation, intortion	CN III

5. Visual Field Testing → detects pathology anywhere along the visual pathway.

- a. Confrontational visual fields →method
  - i. Sit directly across from patient with patient covering one eye and looking directly at your eye (their left eye looking directly at your right eye)
  - ii. In all quadrants, have the patient count fingers on your peripherally extended arm and compare to your ability to see the same image

6. External eye examination and adnexa

- a. Lids
  - i. Upper and lower lid eversion → looking for foreign bodies
  - ii. Lid margins → lacerations, blepharitis
  - iii. Palpebral conjunctiva →infection, paleness
- b. Lashes → lice
- c. Limbus → diffuse or focal injection suggests inflammation or iritis
- d. Preauricular adenopathy → presence suggests viral conjunctivitis
- e. Enophthalmos
- f. Exophthalmous

7. Fluorescein stain of the cornea

- a. Corneal stroma has a different pH than normal corneal epithelium
- b. This difference in pH allows fluorescein placed into the eye to identify epithelial defects
- c. Use cobalt blue light or woods lamp to excite fluorescein
- d. Causes of epithelial defects include:
  - i. Corneal abrasion → most common cause
  - ii. Corneal ulcer → most frequently seen in contact lens wearers
  - iii. Herpes simplex keratitis
  - iv. Corneal laceration
- e. Seidel's test or Seidel's sign
  - i. Presence of a positive Seidel's test suggests an open globe
  - ii. Fluorescein leaking from an injured cornea causing a stream of aqueous down the cornea indicates a positive Seidel's test

8. pH

- a. Normal pH of the eye is 7.4
- b. pH testing must be preformed in patients with chemical injury only after irrigation
- c. Wait 20 minutes after irrigation is complete and the patient is asymptomatic before testing

- d. May use standard pH paper or urine dip stick
9. Optikokenitic drum → tests for feigned blindness
  - a. A shaken newspaper may substitute for the optikokenitic drum
  - b. Procedure: Place the person who complains of blindness in front of an open, 2-page newspaper with their eyes open. Quickly move the paper side to side in short 4-6 inch strokes. A person who is feigning blindness will track the printed newspaper as it moves from side to side.
10. Tonometry → measures intraocular pressure (IOP)
  - a. Normal pressure is 8-21mmHg
    - i. Pressure less than 8mmHg suggests open globe
    - ii. Pressure greater than 21 mmHg suggests glaucoma or other cause in increased IOP
  - b. Shiotz tonometer (see separate handout)
  - c. Tonopen (see separate handout)
  - d. Applanation tonometry
  - e. Digital palpation
11. Slit Lamp Examination (see detailed handout)
  - a. Corneal abrasion
  - b. Corneal foreign body
  - c. Iritis
12. CT of orbits
  - a. Utility
    - i. Intraocular or intraorbital foreign body detection
    - ii. Open globe
    - iii. Identification of orbit injury
    - iv. Identification of retroorbital hematoma
    - v. Suspected orbital or periorbital cellulitis
13. Direct Fundiscopic Examination → not very useful in ED setting
  - a. Structures
    - i. Optic Disc
      1. Pallor
      2. Cup to Disc ratio
      3. sharpness of the Disc
    - ii. Macula
    - iii. Vessels
    - iv. Retina
  - b. Panoptic ophthalmoscope gives 5X large view of the retina than standard ophthalmoscope

## **Specific Ocular Conditions**

### **Eye Trauma**

Ruptured globe

Hyphema

Blow Out Fractures

Lid Lacerations

Corneal Abrasions

### **Ruptured Globe Evaluation**

- History of trauma and pain or decreased vision
- Severe subconjunctival hemorrhage
- Deep or shallow anterior chamber
- Limited extra-ocular motility (greatest in direction of rupture)
- Intra-ocular contents outside globe

### **Ruptured Globe Care**

- Immediate ophthalmologic consult
- Metal shield
- NPO
- Antibiotics and tetanus prophylaxis
- Antiemetics
- CT scan with axial and coronal views

### **Hyphema**

- Blood in anterior chamber
- History of trauma, pain, blurred vision
- Hyphema: Layering of blood, usually visible grossly
- Microhyphema: Suspended RBCs visible with slit lamp

### **Hyphema Workup**

- Note mechanism and time of injury: vision loss occurs at time of injury
- Rule out ruptured globe
- Consider CT scan for associated injuries
- Screen for sickle cell trait or disease

### **Hyphema Treatment**

- Immediate ophthalmologic evaluation
- Elevate head of bed 30 degrees
- Metal shield
- Atropine drops, consider aminocaproic acid
- If increased IOP, use  $\beta$ -blockers

### **Hyphema Treatment**

- Consider hospitalization (bed rest)
- Corneal staining, increased IOP, rebleed-complications

### **Blow Out Fractures**

- Pain on attempted vertical movement,
- binocular diplopia, eyelid swelling and crepitus
- Restricted eye movements, hypesthesia of infra-orbital nerve
- Obtain CT scan of orbits and face (axial and coronal views)

### **Blow Out Fracture Treatment**

- Nasal decongestants
- Oral antibiotics: Keflex
- Do not blow nose
- Neurosurgery consult if orbital roof fracture
- Ophthalmology consult in 7-14 days after trauma
- for persistent diplopia or enophthalmos

### **Lid Lacerations**

- Make sure no injury to globe
- CT scan if foreign body or ruptured globe suspected
- Consult ophthalmology

## **Corneal Abrasions**

- Defect in corneal surface epithelium
- Traumatic abrasions
- Foreign Body related abrasions
- Contact lens related abrasions
- Spontaneous abrasions or recurrent erosions
- Mild conjunctival injection, if abrasion is few hours old
- Ciliary flush if abrasion is more than few hours old
- Corneal edema may be present if abrasion present for >12 hours
- A nearly healed abrasion may have branching appearance (pseudo-dendrite)
- Foreign body sensation: patient is keeping affected eye shut
- Visual acuity may be normal if abrasion is away from visual axis
- Use fluorescein staining to confirm diagnosis
- Use topical anesthetic to facilitate visual acuity testing

## **Corneal Abrasion Treatment**

- Tetanus prophylaxis probably not necessary
- Patching controversial
- Cycloplegic agent to prevent traumatic iritis
- Topical antibiotics
- Topical NSAIDs
- Large abrasions or abrasions from contact lens: daily follow up
- Small abrasions: Follow up in 2-5 days

## **Contact Lens Wearers**

- High risk of pseudomonas keratitis (keratitis causes a foreign body sensation)
- Do not patch
- Ophthalmologist in 12-24 hours
- Use quinolone not aminoglycoside

## **Abnormalities of Lids and Lashes**

- Blepharitis
- Hordeolum
- Chalazion
- Dacrocystitis
- Orbital and Peri-orbital Cellulitis

## **Blepharitis**

- Itching, burning, foreign body sensation, crusting around eyes on awakening
- Crusty, red, thickened eyelid margins
- Usually due to staph or seborrhea

## **Blepharitis Treatment**

- Scrub eyelid margins with mild shampoo BID
- Warm compresses BID-QID
- If moderate to severe, use erythromycin or bacitracin ointment qhs
- Follow up in 3-4 weeks
- Condition often improves but does not resolve completely

## **Hordeolum**

- Swelling, pain, tenderness, erythema
- Self limited; resolves in 5-7 days with spontaneous drainage
- Warm compresses for 15-20 minutes QID
- Follow up in 3-4 weeks if no improvement

## **Chalazion**

- Foreign body reaction to lipid produced by gland
- Rubbery, subacute, often nontender

- May resolve spontaneously if duct of gland opens
- Warm compresses
- Follow up in one month

### **Dacrocystitis**

- Tender swelling of medial lower lid
- Excessive tearing or purulent discharge
- Congenital: massage area gently, refer at 9-12 months
- Acquired: refer for surgical correction

### **Orbital Cellulitis**

- Direct extension from sinus infection, orbital fracture, dental infection
- Symptoms: pain, fever, URI symptoms, swelling of lids
- Restricted extra-ocular movements, proptosis, decreased vision

### **Orbital Cellulitis Treatment**

- Orbital cellulitis: orbital CT scan, CBC and blood cultures, IV antibiotics (ceftriaxone and vancomycin)
- Complications: meningitis and cavernous sinus thrombosis
- Peri-orbital cellulitis may be treated as outpatient if mild, patient is older than 5 years and good followup

### **Cornea, Anterior Chamber Problems**

- Keratitis
- Iritis
- Acute angle closure glaucoma

### **Herpes Keratitis**

- Unilateral red eye, pain, photophobia, decreased vision, rash
- Vesicles, diffuse conjunctival injection or ciliary flush, preauricular nodes
- Punctate lesions, dendritic pattern, ulcers
- Test corneal sensitivity before topical anesthetic because herpes may affect the blink reflex

### **Herpes Keratitis Treatment**

- Ophthalmology consult
- No topical steroids
- Topical anti-virals (ganciclovir or acyclovir)
- Follow up in 2-5 days to evaluate response

### **Iritis**

- Pain, photophobia, mildly decreased vision
- Ciliary flush, miosis, cells in anterior chamber
- Many causes: trauma or immune mediated
- Recognize and refer
- Cycloplegic agent depending on severity
- Follow up every 1-7 days

### **Acute Angle Closure Glaucoma**

- Pain, blurred vision, colored halos around lights, frontal HA, nausea, vomiting
- Fixed mid dilated pupil, conjunctival injection
- Increased intra-ocular pressure

### **Glaucoma Treatment**

- Ophthalmology consult
- If severe vision loss, use topical  $\beta$  blocker, steroids, carbonic anhydrase inhibitor, pilocarpine, apraclonidine, mannitol, laser iridectomy
- If vision loss is less severe and IOP < 50, parenteral and oral meds may not be needed

### **Focal Conjunctival Redness**

- Inflamed pingueculum
- Pterygium
- Subconjunctival hemorrhage

### **Pingueculum/Pterygium**

- Protect eye from sun, dust and wind
- Lubrication with artificial tears
- For mildly inflamed pingueculum, use topical vasoconstrictor
- Follow up asymptomatic patients every 1-2 years; if using vasoconstrictor, follow up in 2 weeks.

### **Subconjunctival Hemorrhage**

- Red eye, usually asymptomatic
- Etiology: valsalva (coughing or straining), trauma, hypertension, bleeding disorder
- Resolves spontaneously in 1-2 weeks

### **Conjunctivitis**

- Benign, self limited condition due bacteria, virus, or allergy
- Unilateral or bilateral; lids matting in AM, vision intact
- Diffuse injection of palpebral conjunctiva (inside lid) and bulbar conjunctiva (globe)

### **Viral Conjunctivitis**

- May be part of prodrome including fever, pharyngitis, nasal congestion
- Second eye is involved in 24-48 hours
- Symptoms usually get worse for 3-5 days with gradual resolution over 1-2 weeks
- Incubation period: 5-12 days
- Period of communicability: incubation period to 14 days after onset

### **Bacterial Conjunctivitis**

- Self limited; lasts 2 days to 3 weeks, usually 7 days
- Transmission via contact with discharge from infected people, directly or from fingers, clothing or other articles.
- Incubation period 24-72 hours
- Period of communicability: Course of active infection

### **Bacterial Conjunctivitis Treatment**

- Treatment with antibiotics prevents spread, hastens recovery, and prevents complications
- If bacterial etiology, should respond to antibiotics in 1-2 days
- No need for routine cultures
- If symptoms increase during therapy, patient should be referred to ophthalmologist

### **Hyperpurulent Conjunctivitis**

- Severe purulent discharge, onset 12-24 hours
- Marked chemosis, eyelid swelling
- Gram stain, cultures
- Ophthalmology consult; admit if corneal involvement
- If not hospitalized, daily follow up

### **Allergic Conjunctivitis**

- Remove allergen
- Topical OTC antihistamine/decongestants
- Cool compresses
- If no response after 3-4 weeks, treat in conjunction with ophthalmologist (patanol or acular)

### **Conjunctivitis**

- Diagnosis of exclusion
- Patients should have normal vision
- There should be no focal pathology
- There should be no evidence of keratitis, iritis or glaucoma
- Injection should be diffuse involving palpebral and bulbar conjunctiva

### **Chemical Burn**

- Copious irrigation before evaluation for at least 30 minutes
- Wait 20 minutes before testing pH (7.0)



- Fluid of choice is not important
- After irrigation, measure vision, IOP and fluorescein staining
- Severe burns consist of pronounced chemosis, corneal edema and opacification, increased IOP, burns of surrounding skin

#### **Chemical Burns Treatment**

- Ophthalmology consult; hospitalization
- Cycloplegic agent, topical antibiotic, topical steroids

#### **Central Retinal Artery Occlusion**

- Unilateral, painless loss of vision occurring over seconds
- Afferent pupillary defect, cherry red spot
- Immediate ocular massage, hyperventilation
- Acetazolamide IV or PO 500mg; topical  $\beta$  blocker, timolol