Introduction to the Basic Ophthalmologic Exam

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Important Note!

Information within this presentation and the dilated eye lab will be tested within the IS-MSN module exam

Ophthalmology Resources

- 1. Anatomy Zone Eyeball Anatomy (10 min)
- 2. <u>Tim Root Anatomy of the Eye</u> (25 min)
- 3. How the Eye Works nearsighted and farsighted (3 min)
- 4. <u>University of Utah Cranial Nerve Exam</u> (various)

Lecture/Lab Objectives

- 1. Recognize descriptions of the following terms and be able to note on a photo/patient:
 - Astigmatism, myopia, hyperopia, presbyopia
 - Ptosis
 - Ectropion, entropion
 - Exophthalmos/proptosisChalazion

 - Hordeolum (stye)
 - Subconjunctival hemorrhage
 - Pterygiúm
 - Arcus senilis
 - Corneal abrasion
 - Leukocoria
 - Anisocoria
 - Strabismus, esotropia, exotropia
 - Papilledema

Astigmatism:

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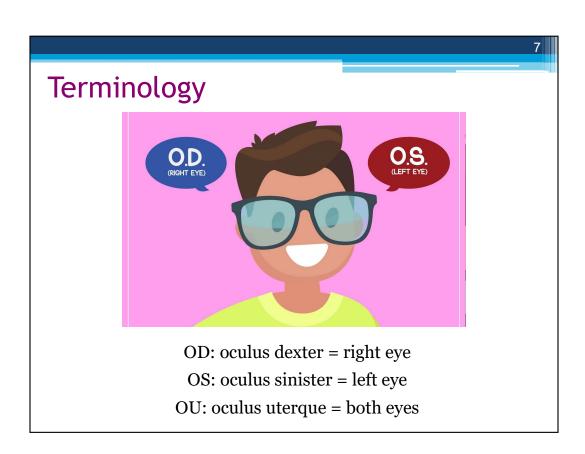
Lecture/Lab Objectives

- 2. Recognize pathologies seen on exam of the following structures and be able to identify them on a photo/patient:
 - Eyelids and orbit
 - Conjunctive and sclera
 - Cornea
 - Retina

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Lecture/Lab Objectives

- 3. Select the element of the basic eye exam that best evaluates each of the following:
 - Central vision
 - Peripheral vision
 - Possible papilledema
 - Afferent pupillary response
 - Strabismus (Possible esotropia or exotropia)
 - Integrated function of CNs III, IV & VI
 - Corneal abrasion
- 4. Perform the elements of a basic eye exam

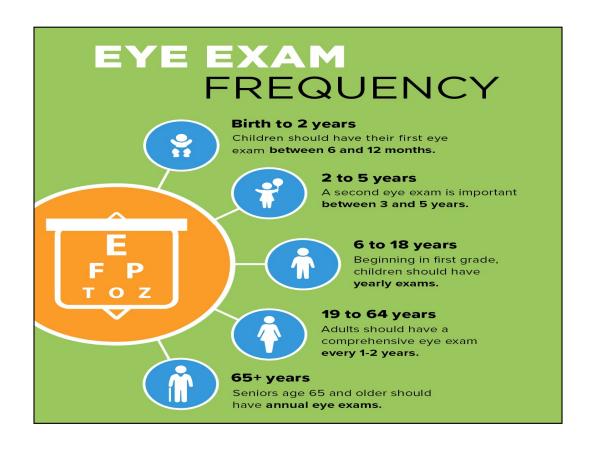


When Should a Basic Eye Exam be Done?

- 1. Complete physical
- 2. Neurologic exam
- When trying to determine if you need to refer to an ophthalmologist or optometrist
- 4. Eye complaints
 - Red eye
 - Visual loss/blurred vision
 - Diplopia
 - Eye pain/swelling
 - Trauma
 - Foreign body
 - Discharge

Red eye, visual loss/blurred vision, trauma, foreign body, eye pain, diplopia (NB monocular? Binocular?) Lid drooping, discharge/secretions, itching, edema, or redness

Some patients will need routine referral to ophthalmologist (e.g., patients with diabetes)



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The Basic Eye Exam

External

Inspect eyebrows, orbit and eyelids Inspect conjunctivae and sclerae Palpate bony orbit Look at the cornea

Functional

Check pupils Check eye alignment Check eye movements Test visual acuity

- Central vision
- Peripheral vision

Color vision as needed

Internal (ophthalmoscopic exam) Fundus (retina)

Lens

<Slit-lamp for anterior chamber>



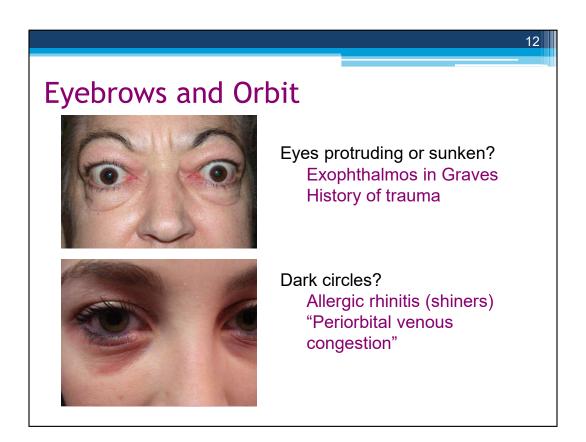
Eyebrows

- Size, extension, texture of hair
- Unusual hair loss? Think hypothyroidism, and ask if the patient plucks or waxes. Part of generalized hair loss as follicles enter resting phase too early

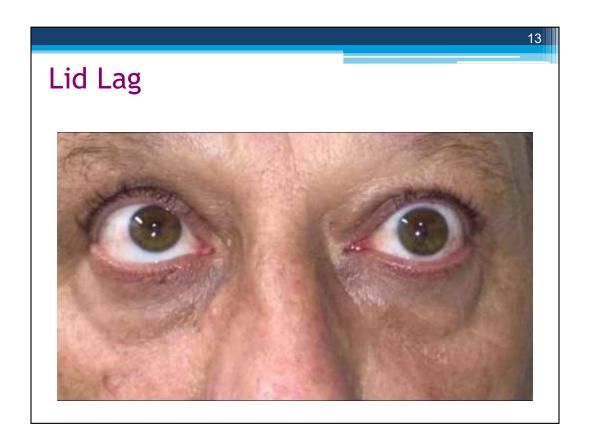
Orbital area

- Assess skin texture, color.
 Look for edema.
- Dark circles may indicate allergies
- •Eyes sunken? Protruding?
- Periorbital edema can be a sign of nephrotic disease
- •Peter, K. D. (2008). *Oedema.jpg.* Wikimedia Commons.

https://commons.wikimedia.org/wiki/File:Oedema.jpg



yasser a. (2017, December 5). *Proptosis.jpg.* Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Proptosis.jpg



Most often associated with hyperthyroidism

Normal eyes should have the eye covering the iris

Inspect Eyelids



Blepharitis: inflammation along the lashes caused by mites, infection, seborrhea, allergies, etc.

- Symptoms: redness, irritation, foreign body sensation, light sensitivity, blurred vision.
- Treatment: eyelid hygiene, artificial tears, warm compresses

Note the condition of the skin

Any lesions, erythema, crusting?

Inspect lightly closed eyes for tremor (associated with hyperthyroidism)

Look for symmetry of the opened eyes

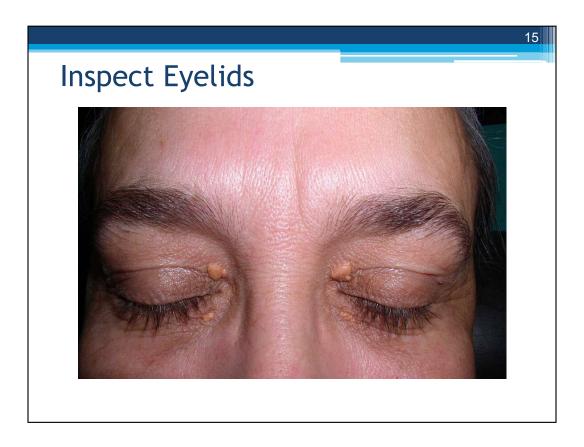
 Does an upper lid droop significantly? (ptosis)

Watch the patient open and close the eyes (CNs III to open and VII to close)

Are the lids everted or inverted?

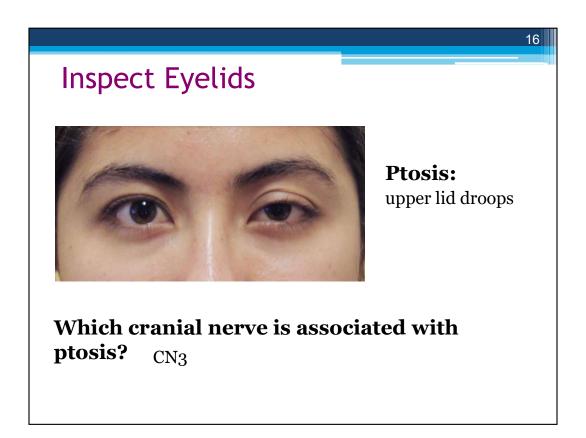
Blepharitis: crusting along the lashes caused by infection, seborrhea, allergies, etc. Common condition.

Eyelid hygiene: eyelid scrubs/baby shampoo.



Xanthelasmas Cholesterol deposits in the skin Idiopathic cause

Associated with hypercholesterolemia, hyperbetalipoproteinemia, \uparrow LDL cholesterol



Note the condition of the skin

Any lesions, erythema, crusting?

Inspect lightly closed eyes for tremor (associated with hyperthyroidism)

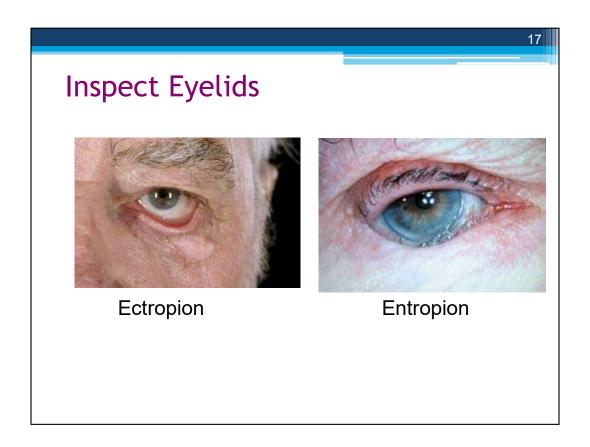
Look for symmetry of the opened eyes

Does an upper lid droop significantly? (ptosis)

Watch the patient open and close the eyes (CNs III to open and VII to close)

Are the lids everted or inverted?

Causes of ptosis: CN3 palsy, sympathetic nerve injury (Horner = ptosis, miosis, anhydrosis), neuromuscular disease (botulism, myasthenia gravis)

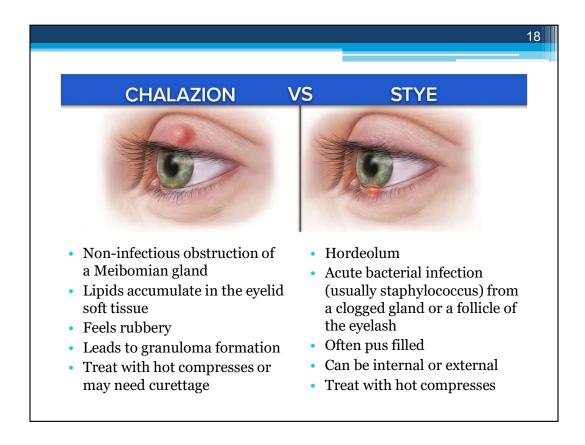


Ectropion and Entropion

Ectropion – dry eyes causing abrasions/ulcers (tx drops, taping at night, surgery, artificial tears),

Symptoms include epiphora (excessive watering), redness, blurry vision

Entropion – corneal abrasions, thinning. Eye infections (tx with drops, soft contacts, stitching, botox, surgery)

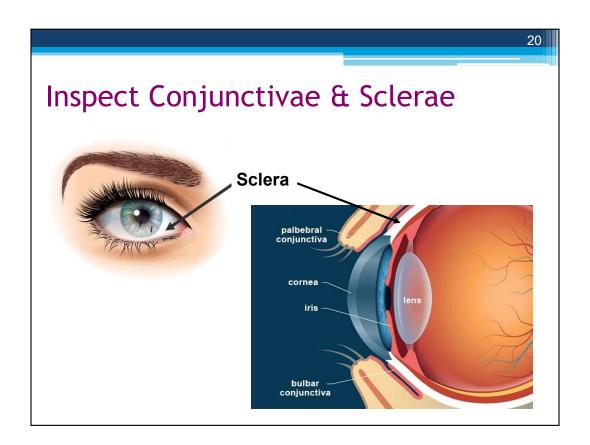


Chalazion: non-infections obstruction of a meibomian gland. Causes lipid material to accumulate in the eyelid soft tissue. This becomes inflamed and forms a granuloma. Will develop and localize within 1-2 days and then reabsorb over 2-8 weeks.

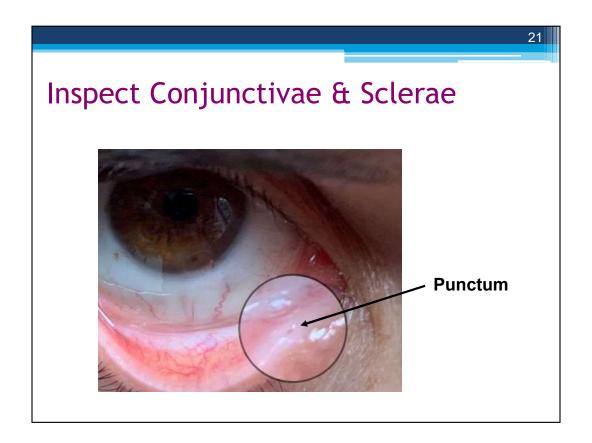
Hordeolum (stye): acute bacterial infection (usually staph) that results from clogged gland (usually Zeis or Moll) or a follicle of the eyelid. Often pus filled. Will also develop in 1-2 days, but may rupture on its own over 2-4 days (more acute onset and resolution than a chalazion). Tx is hot compresses 3-5 times a day to get it to drain.



For looking at the top of the conjunctiva, or foreign bodies.



Next slide for details



Gently pull lower lids down, then upper lids up, noting color and texture of the mucosa. Assess punctum.

Normal conjunctivae are usually inapparent, clear and free of erythema

Erythema = inflammation or infection

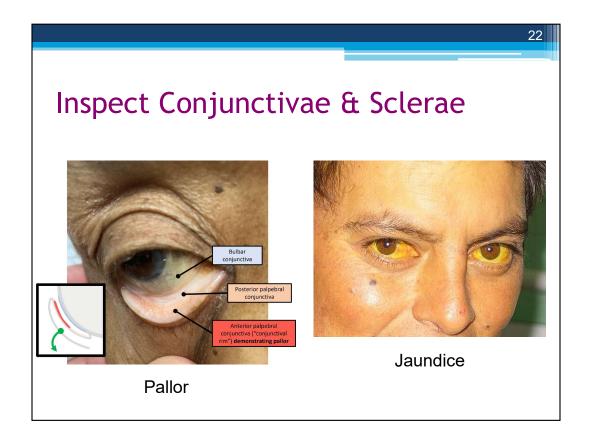
Bright red blood = subconjunctival hemorrhage

Sclerae are usually white

 Normal variant: senile hyaline plaque, a dark, slate gray pigment just anterior to the insertion of the medial rectus muscle

Punctum: Tear duct area

Limbus: junction of the cornea and sclera.



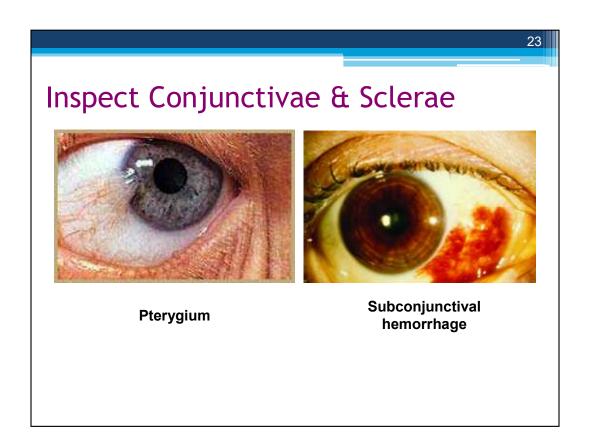
Pallor: iron deficiency anemia

Jaundice: occurs due to hyperbilirubinemia. Can be caused by a variety of liver conditions.

Arman A. Shahriar, Jason T. Alexander. <u>Pallor of the Conjunctival Rim</u>. AIM Clinical Cases.2023;2:e230381. [Epub 18 July 2023].

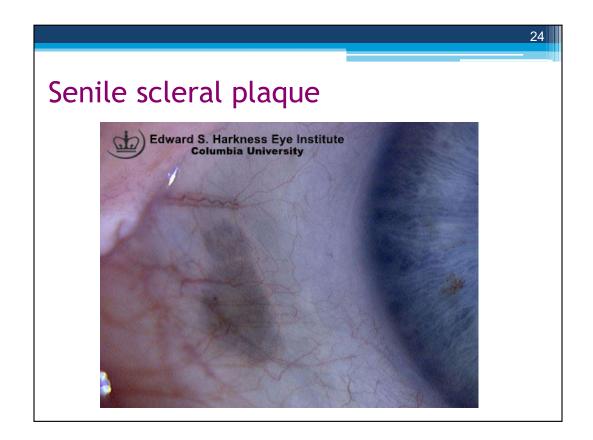
doi:10.7326/aimcc.2023.0381

Toro, S. J. (2011, February 24). *Scleral Icterus.jpg* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Scleral Icterus.jpg



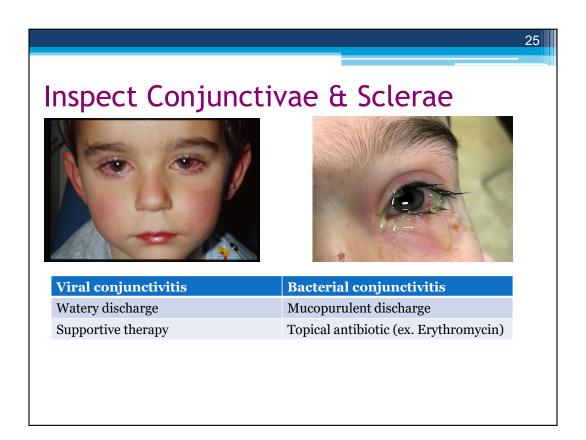
Pterygium - A **pterygium** is a pinkish, triangular tissue growth on the cornea of the eye. It typically starts on the cornea near the nose. It may slowly grow but rarely grows so large that it covers the pupil and impairs vision. Often both eyes are involved. The cause is unclear. It appears to be partly related to **long term exposure to UV light and dust**, and genetic factors also may be involved. It is BENIGN. Conditions that look similar include pinguecula, or marginal corneal degeneration.

Prevention may include wearing sunglasses and a hat if in an area with strong sunlight. Surgical removal is typically only recommended if the ability to see is affected.

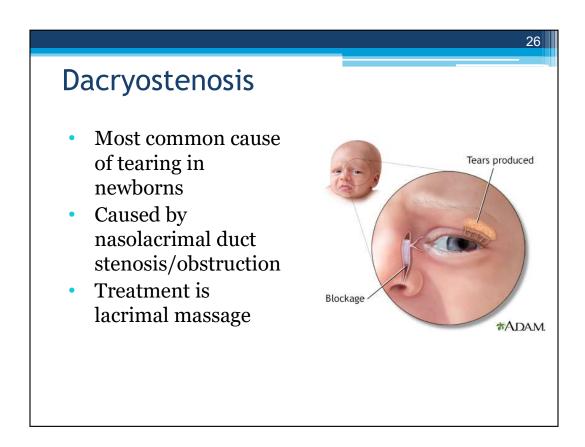


Sclerae are usually white

- •Normal variant: senile hyaline plaque, a dark, slate gray pigment just anterior to the insertion of the medial rectus muscle; often bilateral
- Commonly caused by calcium deposition
- Rarely, may be a melanoma

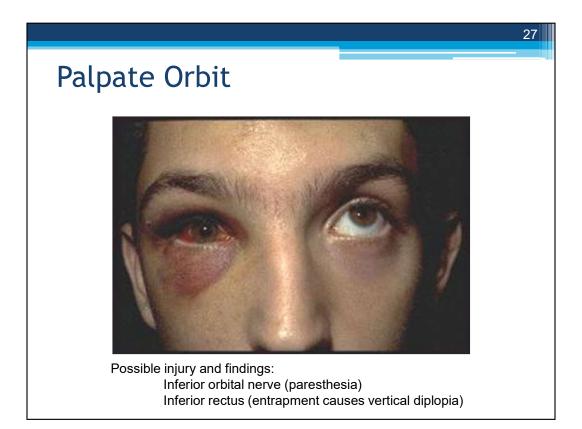


- Treatment: artificial tears, warm/cold compresses, discontinue contact use
- In practice, it can be difficult to distinguish between the two. Many doctors will just prescribe antibiotics because it is required by the school before the kids can return.



Unilateral epiphora (watering) in newborns.

Mount Sinai Health System. (2024, July 16). *Blocked tear duct* [Illustration]. In *Health Library – Diseases & Conditions*. Retrieved August 22, 2025, from Mount Sinai Health Library



25 Y.o M who got into a fist fight presents to the ED with a swollen right Eye. He claims his right cheek is completely numb, and when you ask him to look up he experiences vertical Diplopia. The Eye elevates and depresses very poorly.

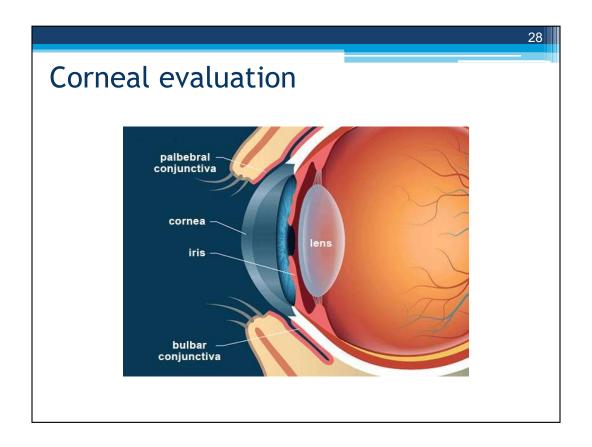
Diagnosis? Orbital Fracture

Simple blowout fractures there may be no continual morbidity associated. The patient may complain of diplopia or hypoesthesia of the cheek and gum. You will most likely see edema and ecchymosis, but they can be temporary.

Sinus injury→ air escapes into the orbit or SubQ tissues = Orbital Emphysema

Fractures along the floor usually affect the **infraorbital groove** and therefore the **infraorbital nerve**. The resultant neuropraxia causes **hypoesthesia of the cheek and upper gum** on the affected side. This is **usually temporary** but can last up to 6 months or longer. In severe injuries, the hypoesthesia may be permanent.

Vertical diplopia may be caused by entrapment of the tissue surrounding the inferior rectus muscle in the fracture site. Results in limited upgaze and may cause pain on attempted upgaze as well. Damage to the nerve branch to the inferior rectus muscle also may cause limited vertical motility. Severe pain with limited horizontal and vertical movements can be indicative of more severe orbital hemorrhage or edema



Changes in vision, abrasions from dryness, foreign body

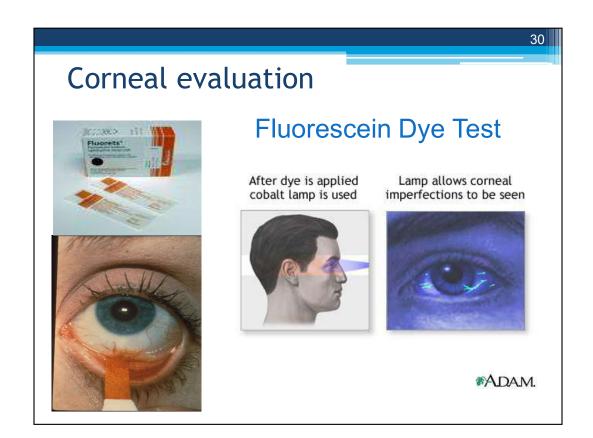
Corneal Inspection

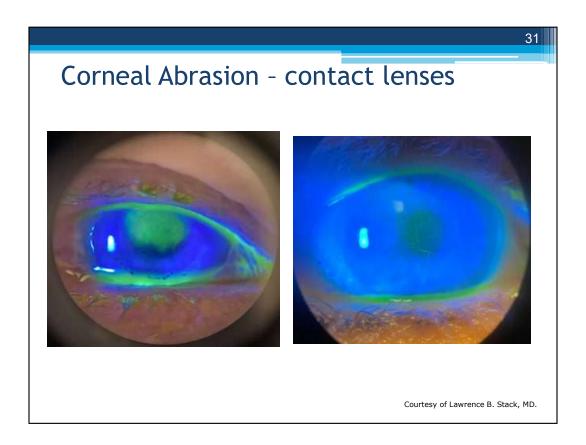
Arcus Senilis



Lipid deposits on the outer region of the cornea

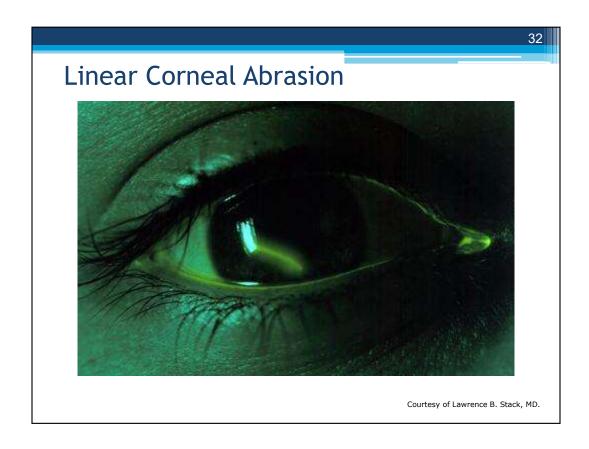
Possible sign of high cholesterol



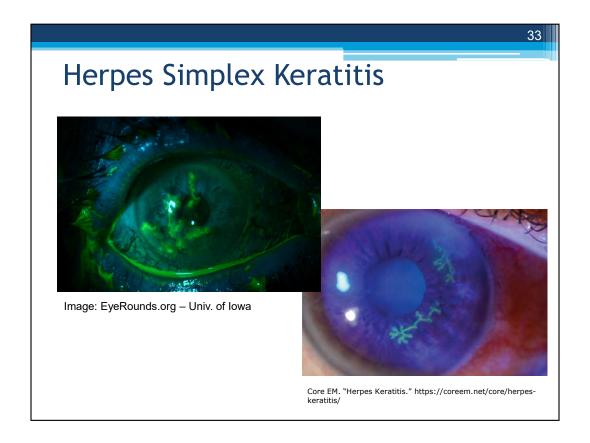


Solid patch shape

Damaged contact lenses, malpositioned, dried, or prolonged use of soft or hard contact lenses may increase the risk of a scratched cornea. [3] Abrasions with contact lenses usually occur when they are removed or torn due to excessive use and dryness.



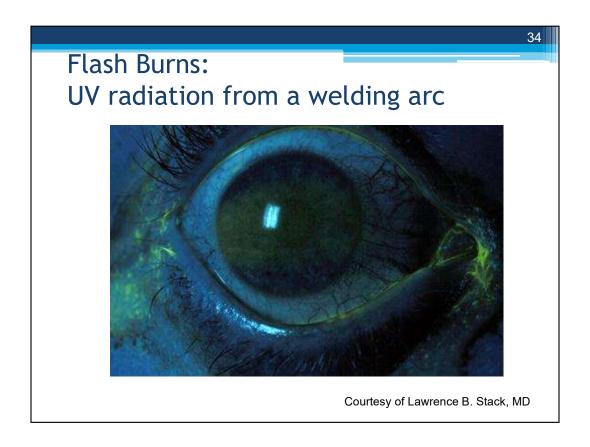
This photo shows fluorescein uptake in a linear corneal abrasion, most likely from an edged foreign body.



This photo shows the characteristic dendritic appearance of corneal lesions caused by a herpes simplex infection. Note how little fluorescein is needed to highlight the lesion; scant fluorescein is visible on the remainder of the cornea.

Bozung, A. (contributor), & Troyer, J. (photographer). (Year not specified). Branching epithelial dendritic lesions in herpes simplex keratitis [Photograph]. In EyeRounds Ophthalmic Atlas, University of Iowa. Licensed under CC BY-NC-ND 3.0. Retrieved from EyeRounds: HSV-Keratitis atlas page

Chien, C. "Herpes Keratitis." *Core EM*, edited by A. Swaminathan, MD, published April 13, 2016, Core Emergency Medicine. Available at: https://coreem.net/core/herpes-keratitis/



This photo shows fluorescein uptake in diffuse punctate lesions of the cornea caused by ultraviolet radiation from an electric welding arc. This is a form of **keratitis**. Sunlight can also cause such an injury.

The Basic Eye Exam

External

Inspect eyebrows, orbit and eyelids Inspect conjunctivae and sclerae Palpate bony orbit

Look at the cornea

Functional

Check pupils

Check eye alignment Check eye movements

Test visual acuity

- Central vision
- Peripheral vision

Color vision as needed

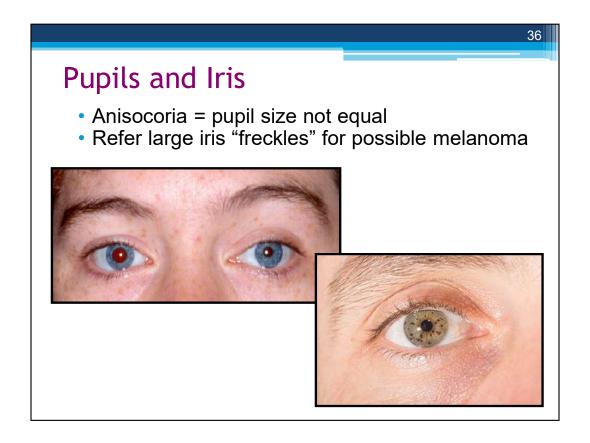
Internal (ophthalmoscopic exam) Fundus (retina)

Lens

<Slit-lamp for anterior chamber>

Functional abnormalities could be caused by a problem with:

- Cranial nerves 2, 3, 4 or 6
- · Intra-ocular pressure
- · Rod/cone/retinal pathology
- Corneal pathology
- · Lens pathology
- Extra-ocular muscles



Check pupil size and shape
Should be round and SYMMETRICAL

Anisocoria can be physiologic – Assume physiologic if the difference in pupil size is small (1mm).

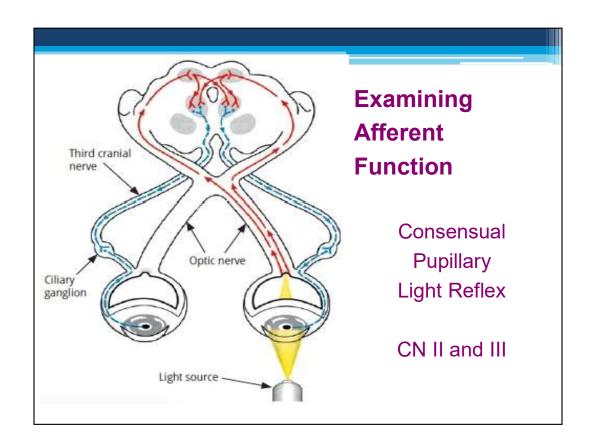
Look at the color and pattern of the iris. Freckles are normal, but large freckles need to have a consideration for melanoma. Refer.

Pupils - Leukocoria



Can be caused by anything that blocks the light going straight through to the retina.

- Retinoblastoma
- Cataract
- Hemorrhage
- Corneal opacity



ONLY FOR REVIEW

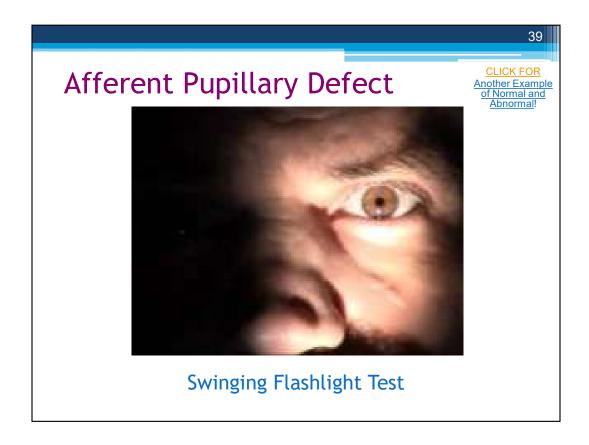
Pupil response to light and the near reflex (one aspect is "accommodation")

Direct and Consensual pupillary light reflex

Accommodation and the Near Reflex -Have the patient look at a distant object, then at an object close to his/her nose.

Near reflex: 1) Both pupils should constrict: plus: 2) eyes converge and 3) the lens changes shape to focus=accommodation).

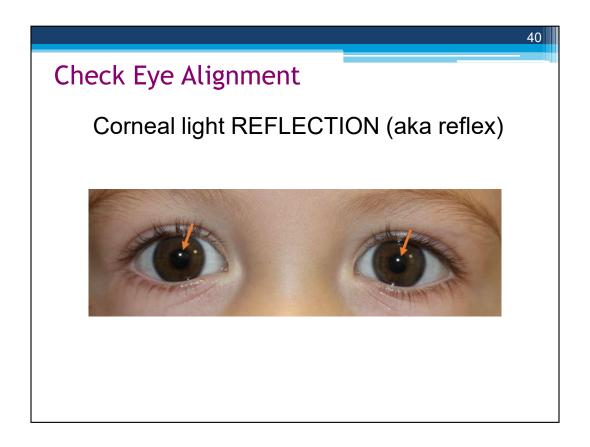
Edinger Westphal (EW) Nucleus neurons are pacemaker cells that are modified by excitatory and inhibitory inputs. Opioids block the inhibition of the EW nucleus. * = locations where hypercarbia, hypoxia, and opioids might potentially interfere with the light reflex. IN = inhibitory neuron.



The afferent or sensory limb of the **pupillary light reflex** is CN2 while the efferent or motor limb is the parasympathetics of CN3.

Tests for an <u>afferent pupillary defect</u> (CN II). Shine the flashlight at one eye noting the size of both pupils. Then swing the flashlight to the other eye. If both pupils now dilate (instead of constrict) then that other eye has perceived less light stimulus (a defect in the sensory or afferent pathway) than the opposite eye.

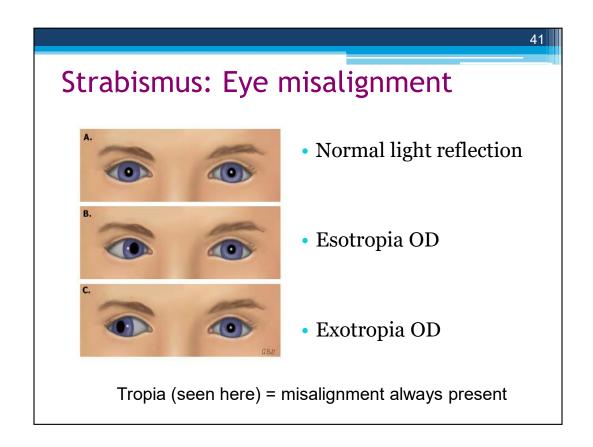
Marcus Gunn Pupil



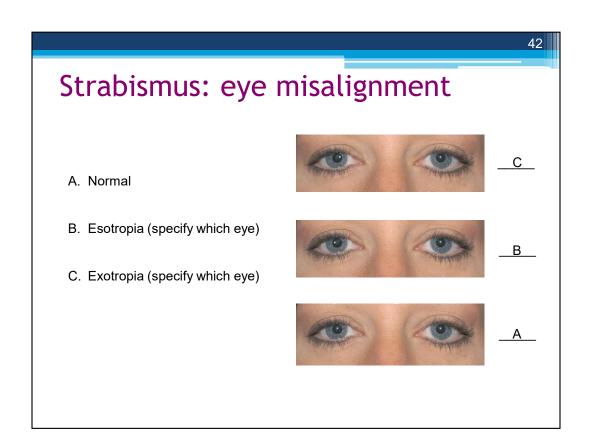
Assesses the integrated function of the oculomotor, trochlear and abducens cranial nerves.

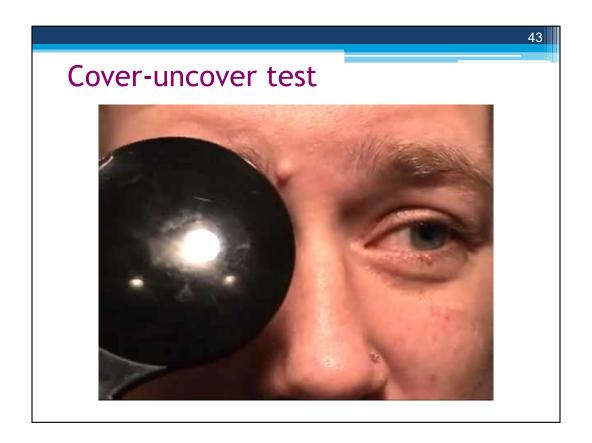
Corneal Light Reflection tests the balance of the extraocular muscles

 While the patient looks at you, shine a light into the eyes, looking for symmetric reflection.

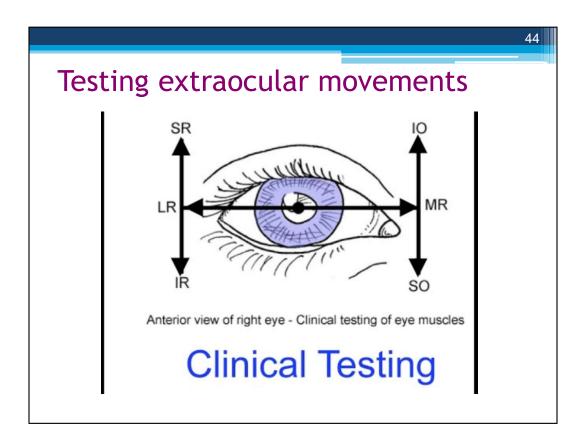


Esotropia eye is Medially oriented so light reflects Laterally Opposite for Exotropia





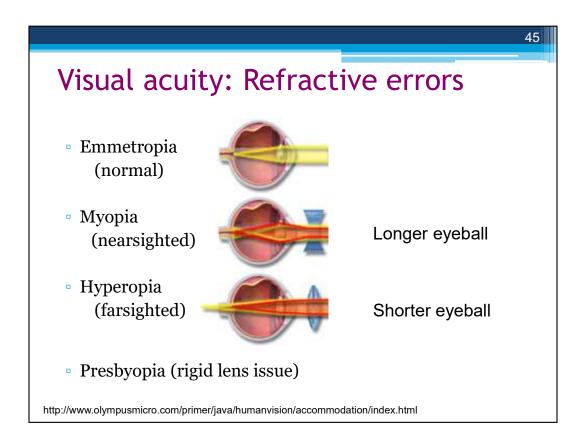
Have patient look at you. Now cover one eye and watch the other eye for drift or movement. Remove the cover and watch for movement of the newly uncovered eye. Repeat on the other side. Correlate this with your findings from the corneal light reflection.



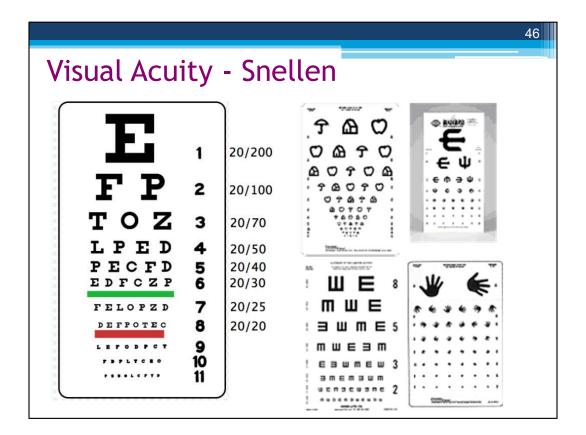
Testing: LR6SO4R3

To isolate SR, look laterally and then up, isolate IO by looking medially and then up

To isolate IR, look laterally and then down, isolate SO by looking medially and then down



Myopic patients at particular risk for? Retinal detachment



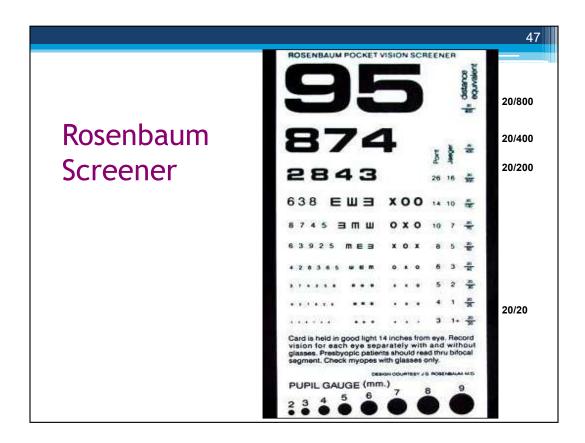
Visual Acuity charts

Snellen

- •To screen far vision. Patient stands 20 feet from the chart.
 - •The numerator indicates the distance from the chart (therefore never varies)= the distance at which the patient can read the line,
 - •The denominator indicates what a person with normal vision can clearly see at that distance specified in feet. The bottom number thus varies according to acuity. Normal acuity is defined as 20/20
- •What would an assessment of 20/200 indicate? 20/15?
- •Test OD (R eye) and OS (L eye) and record both values
- Other: Tumbling E and symbols
- Near card (Rosenbaum, etc.)
 - •Hold at 14 inches. Screen with vision correction (refraction)

OD: oculus dexter
OS: oculus sinister
OU = oculus uterque

Vision of 20/200 is a way of saying, 'what a person with normal vision can see clearly at 200 ft' and 20/15 means 'what a person with normal vision can see clearly at 15 ft'. So 20/200 indicates poor visual acuity and 20/15 indicates better than average visual acuity.

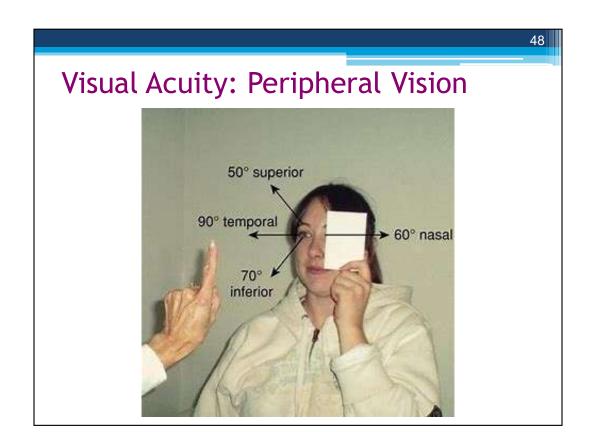


If worse than 6/240 (20/800), acuity should be recorded in terms of counting fingers,

hand motions, light perception, or no light perception. Legal blindness is defined by the

Internal Revenue Service as a best corrected acuity of 6/60 (20/200) or less in the better

Eye. Driving laws vary by state, but most require a corrected acuity of 6/12 (20/40) in at least one eye. (Harrison's Principles of Internal Medicine)



Visual field testing by confrontation—same basic technique as in the screening neurologic exam (by confrontation)

Practice testing eyes individually this time in lab

Sit or stand opposite the patient at eye level, about 1 foot away. Patient covers left eye; you close your right

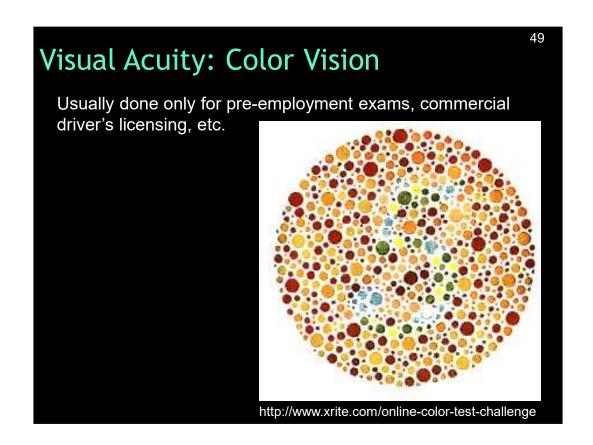
eye. Patient looks directly into your open eye.

Fully extend arms to limits of vision equidistant from patient and move fingers randomly right or left having patient point to finger that moves. Compare to your own (normal) peripheral vision.

Reverse eyes (pt covers right; you close your left)

Test each eye in nasal, temporal, superior and inferior fields.

This test presumes that the examiner's visual fields are intact. The confrontation test is merely for screening and any suspected field deficits must be more thoroughly assessed by either an optometrist or ophthalmologist, where much more precise tests can be performed.



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External

Inspect eyebrows, orbit and eyelids Inspect conjunctivae and sclerae Palpate bony orbit Look at the cornea

Functional

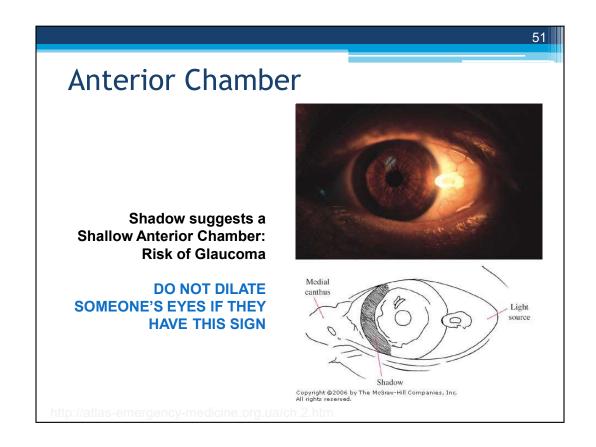
Check pupils Check eye movements Test visual acuity

- Central vision
- Peripheral vision

Color vision as needed

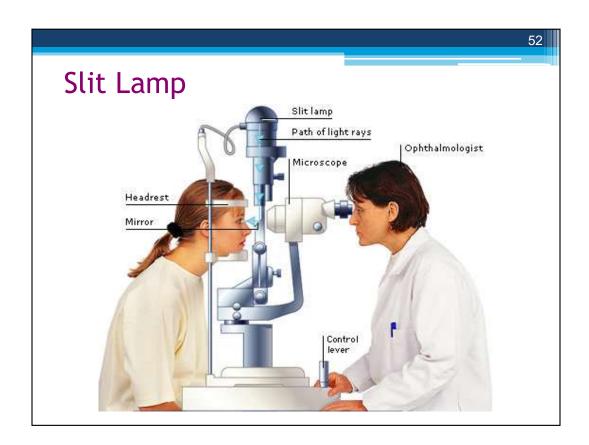
Internal (ophthalmoscopic exam) Fundus (retina)

<Slit-lamp for anterior chamber>

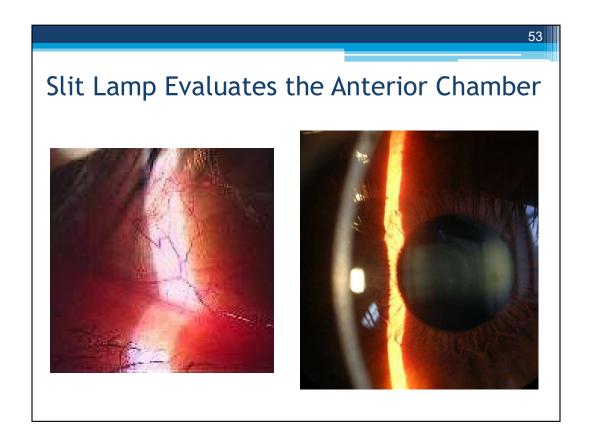


Depth of Anterior Chamber: From the temporal side, shine a light tangentially at the limbus. Note the illumination of the iris nasally. If this does not illuminate, the chamber is shallow, indicating risk of acute-angle glaucoma, and contraindicating use of mydriatic eyedrops. Mydriatic drops induce pupil dilation, which increases pressure in the anterior chamber.

Validity of the exam: https://www.bmj.com/rapid-response/2011/10/31/eclipse-sign-detect-shallow-anterior-chamber



Close evaluation of the anterior aspect of the eye; Eyelids, Conjunctiva, Cornea, Anterior chamber, Iris & Lens, Vitreous humor



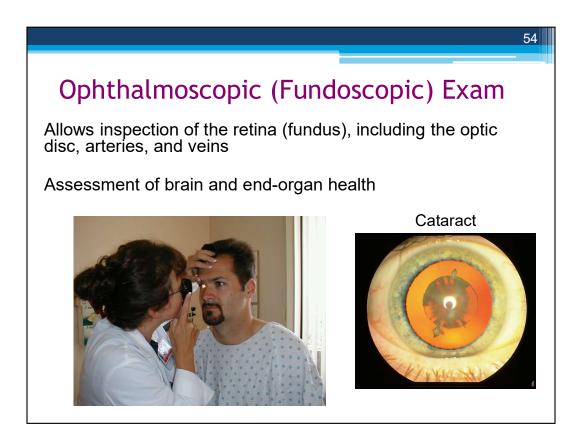
A penlight would give a 2-dimensional view of the anterior chamber. Slit lamp allows for more of a 3D view and magnification. The slit beam also allows for better contrast, allowing the examiner to see any particles in the aqueous humor.

Examples:

Uveitis: inflammatory cells and protein particles

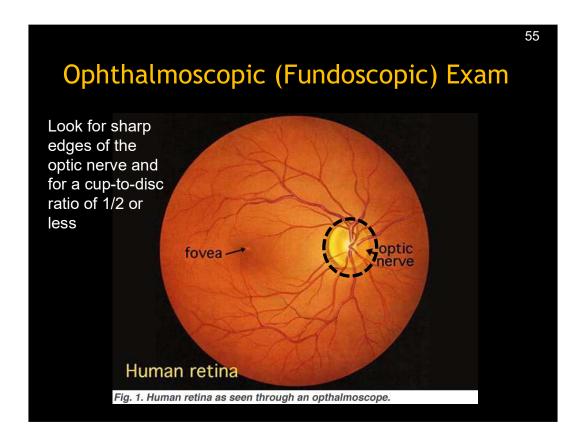
Hyphema or hypopyon: RBC or WBC

AC depth – can be used to assess for risk of narrow angle glaucoma



Hard to do if the room isn't dark.

- •Right for Right. Use the large light aperture and set the lens to 0.
- •Have the patient look at a fixed spot across the room beyond you. From about 12 inches away, put the instrument to your eye and look for the "red reflex"
- Inconsistencies in the color of the "red reflex" might indicate cataracts or other pathology



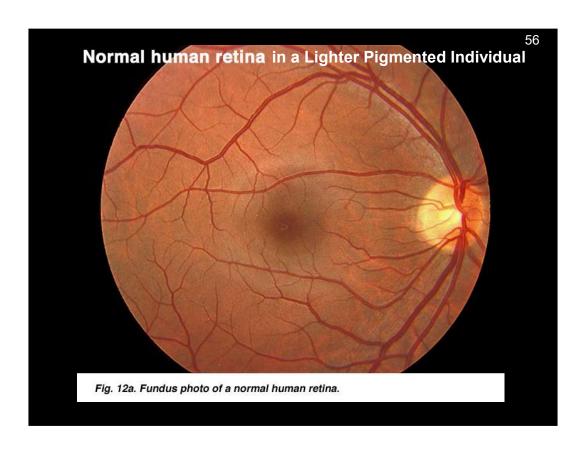
Put your opposite hand on the patient's forehead. This is where you will ultimately 'land' when you look in the eye.

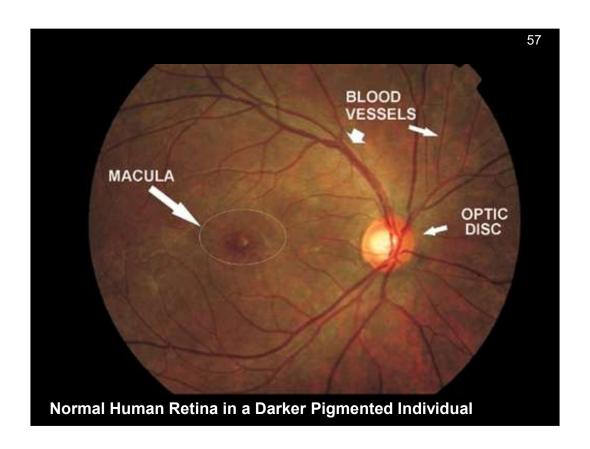
Follow the "red reflex" and move closer slowly. If you lose it, back up and start again. The first structures you will see are blood vessels. Continue to move closer and follow the vessels in (they will lead you to the optic disc.) If things get blurry, adjust the focus slowly with the vertical dial.

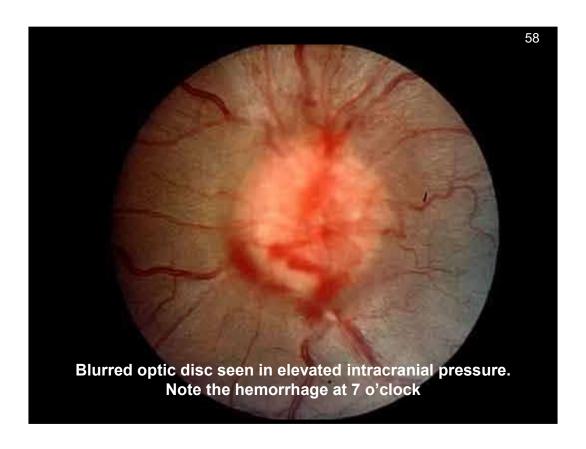
Continue until the instrument rests lightly against the opposite hand. The disc should appear "flat" and bright, with distinct margins.

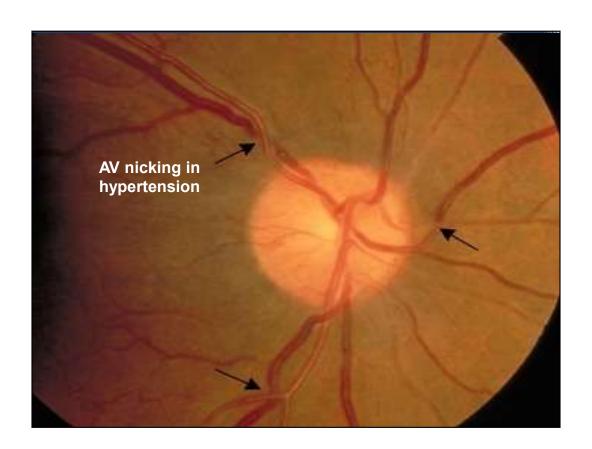
Try to assess the macula, the site of central vision, by having the patient look directly into the light.

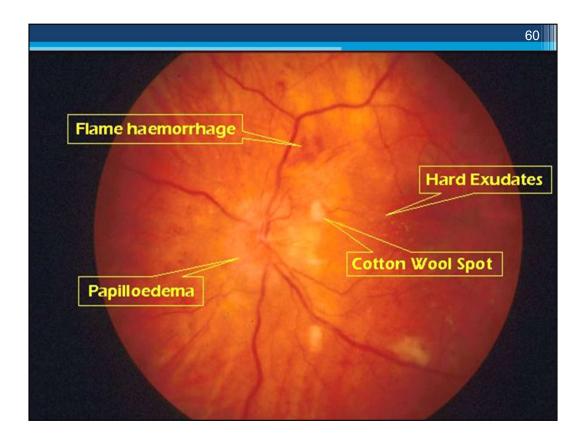
Now that your patient is blind, let them rest their eye afterwards.







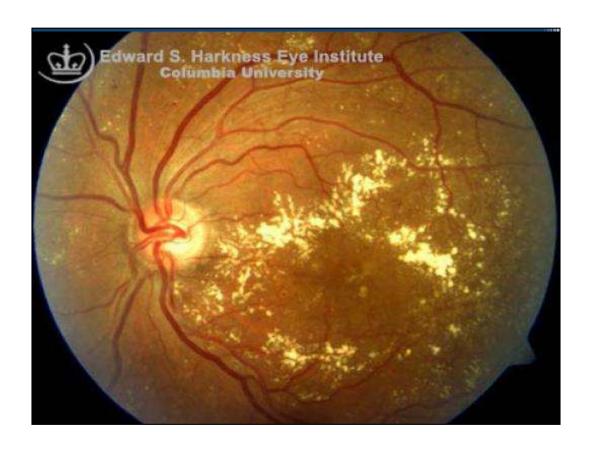




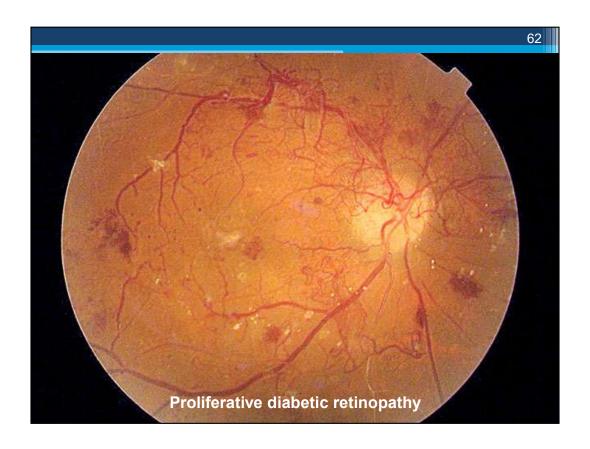
Damage from long-term, untreated malignant hypertension

Flame hemorrhages are caused by high pressure in capillaries that bleed out Hard exudates are a combination of lipoproteins that leak from vessels and are deposited on the retina

Cotton Wool Spots represent the infarction of nerves and axonal organelles that are released out



Hard exudates – lipoproteins leaking from vessels



Proliferative Diabetic Retinopathy. Note tortuous blood vessels.

For the Lab

Bring your ophthalmoscope charged and ready to go!

Everyone will be asked to help their peers learn the basic eye exam by allowing:

- 1. Eyelid eversion
- 2. Eye dilation (one eye)
- 3. Fluorescein staining
- 4. Eyedrop insertion
- 5. Pressure measurement
- 6. Eye ultrasound

Eye Prep for Lab

Please wear glasses instead of contacts

- Fluorescein can stain contacts
- Eyes should be dilated without contacts
- Contacts may get dislodged with manipulation such as ultrasound and/or eyelid eversion

Contacts can be worn after rinsing fluorescein out

Avoid eye make-up during lab

Anyone with glaucoma should NOT be dilated

Eye Prep for Lab

Know your dominant eye!

We will dilate the non-dominant eye

- 1. Make L's with both of your hands
- 2. Bring them together to make a small triangle
- 3. Focus on an object at a distance through the triangle
- 4. Bring your hands towards you, keeping the object in focus
- 5. The eye you bring your hands toward is your dominant eye

