

Eye Exam

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Eye ROS

- Any known eye disorders?
- Change in vision or blurriness?
- Eye discharge?
- Eye redness?
- Eye pain?
- Double vision?
- Change in appearance of eye/surrounding structures?

Eye Exam

Functional Anatomy

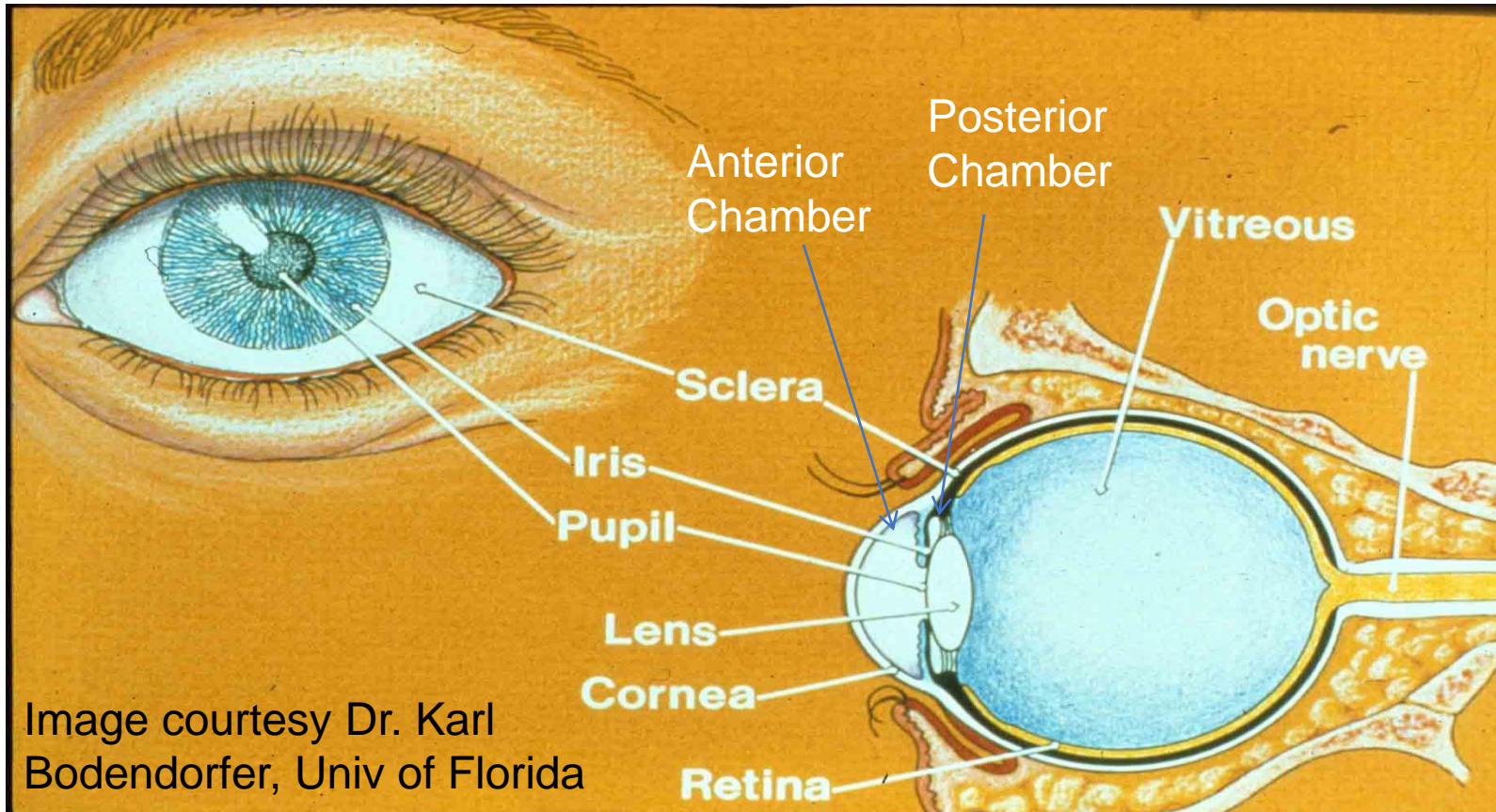
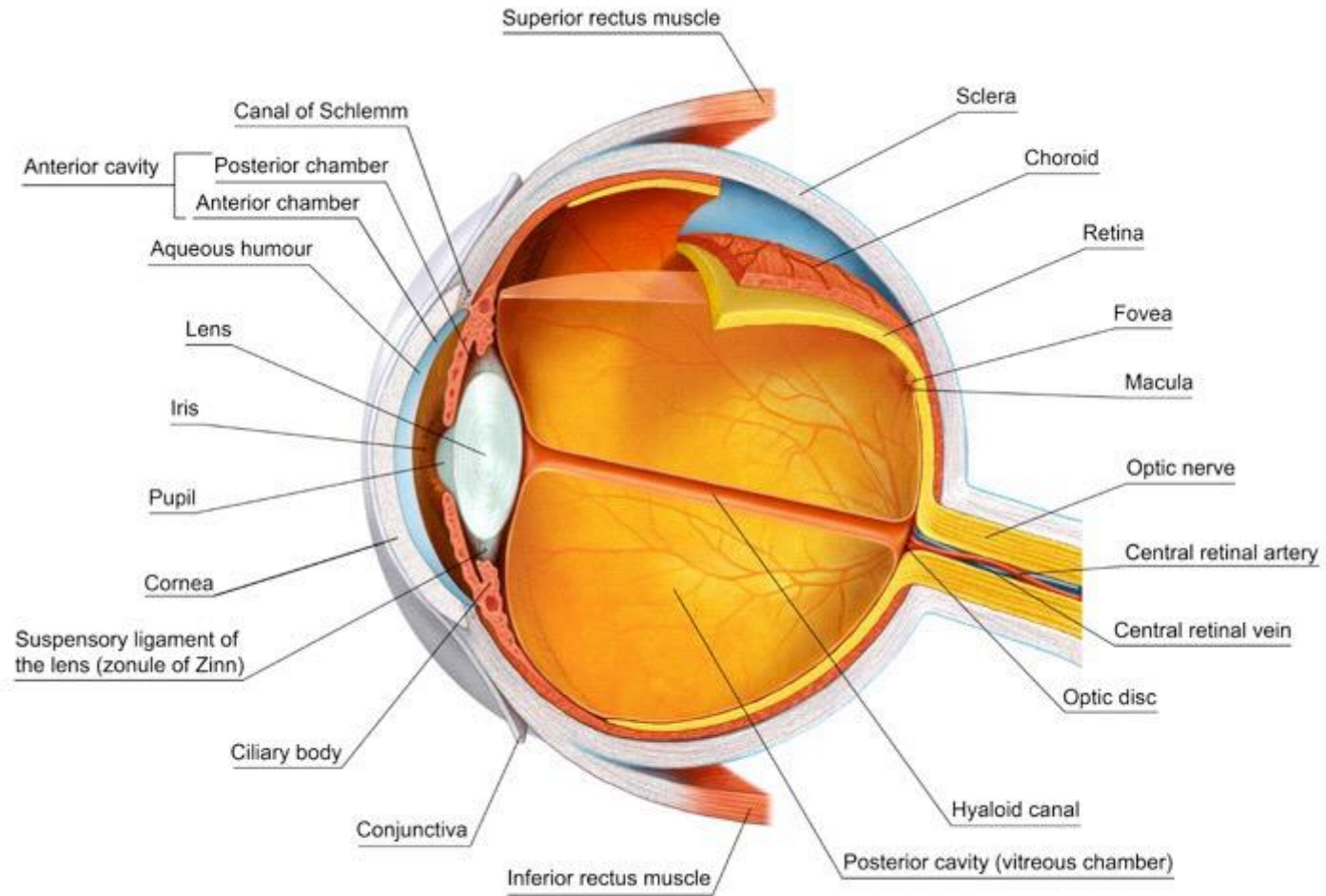


Image courtesy Dr. Karl Bodendorfer, Univ of Florida

More Detailed Internal Anatomy



virtualmedicalcentre.com®

Functional Assessment – Acuity (Cranial Nerve 2 – Optic) – Vital Sign of the Eye

- Using hand held card (held @ 14 inches) or Snellen wall chart, assess each eye separately.
- Allow patient to wear glasses.
- Direct patient to read aloud line w/smallest lettering that they're able to see.



Hand Held Acuity Card

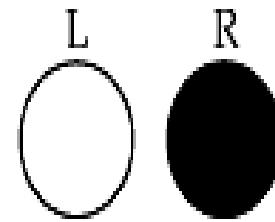
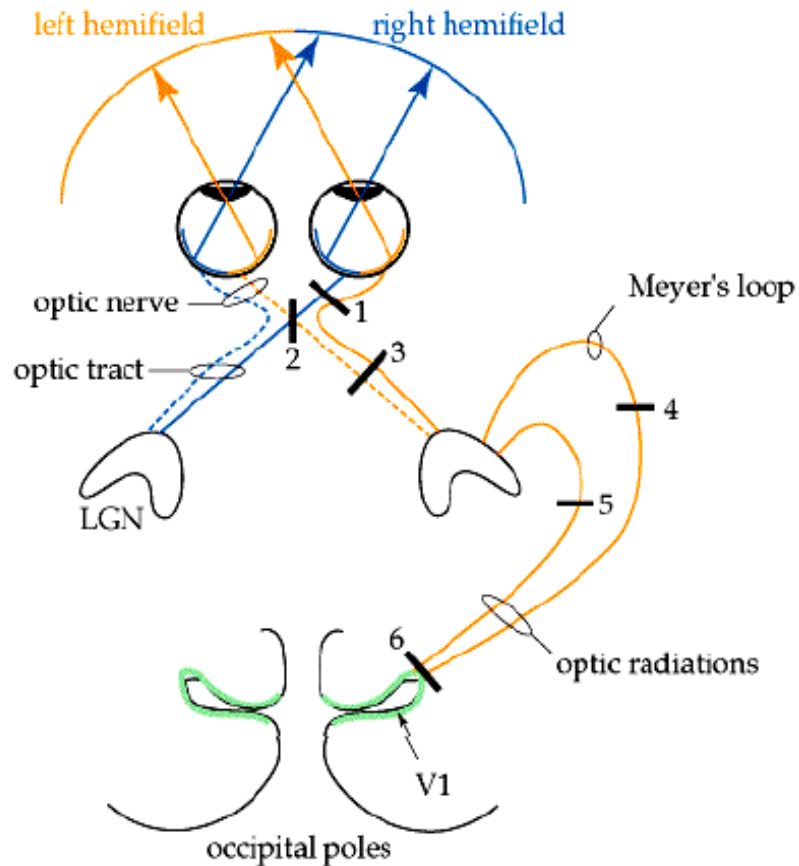
Functional Assessment – Acuity (cont)

- 20/20 =s patient can read at 20` w/same accuracy as person with normal vision.
- 20/400 =s patient can read @ 20` what normal person can read from 400` (i.e. very poor acuity).
- If patient can't identify all items correctly, number missed is listed after a '-' sign (e.g. 20/80 -2, for 2 missed on 20/80 line).



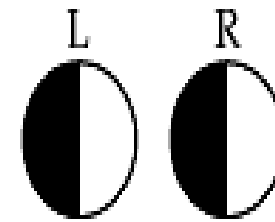
Snellen Chart For Acuity Testing

Functional Assessment - Visual Fields (Cranial Nerve 2 - Optic)



loss of vision
in R eye

Lesion #1



loss of vision in
left hemifield

Lesion #3

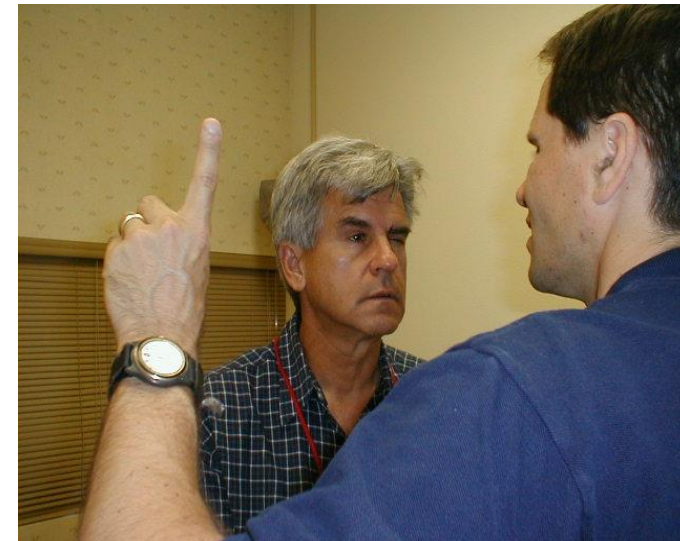
Images Courtesy of Wash Univ.
School of Medicine, Dept
Neuroscience
<http://thalamus.wustl.edu/course/basvis.html>

NEJM Interactive case – w/demo of visual
field losses:

http://www.nejm.org/doi/full/10.1056/NEJMimc1306176?query=featured_home

CN 2 - Checking Visual Fields By Confrontation

- Face patient, roughly 1-2 ft apart, noses @ same level.
- Close your R eye, while patient closes their L. Keep other eye open & look directly @ one another.
- Move your L arm out & away, keeping it ~ equidistant from the 2 of you.
- A raised index finger should be just outside your field of vision.



CN 2 - Checking Visual Fields By Confrontation (cont)

- Wiggle finger & bring it in towards your noses. You should both be able to detect it @ same time.
- Repeat, moving finger in from each of the 4 quadrants
- Use other hand to check medial field (i.e. starting in front of the closed eye).
- Then repeat for other eye.



CNs 3, 4 & 6

Extra Ocular Movements

- Eye movement dependent on Cranial Nerves 3, 4, and 6 & muscles they innervate.
- Allows smooth, coordinated movement in all directions of both eyes simultaneously
- There's some overlap between actions of muscles/nerves

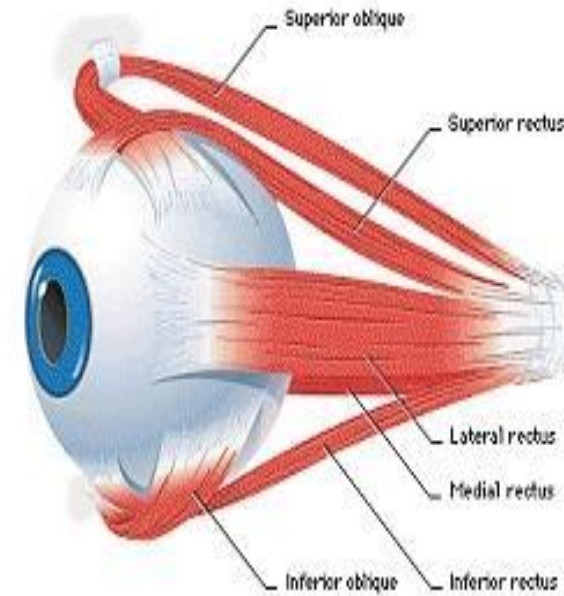


Image Courtesy of Leo D Bores, M.D. Occular Anatomy: http://www.e-sunbear.com/anatomy_01.html

Cranial Nerves (CNs) 3, 4 & 6

Extra Ocular Movements (cont)

- CN 6 (Abducens)
 - Lateral rectus muscle → moves eye laterally
- CN 4 (Trochlear)
 - Superior oblique muscle → moves eye down (depression) when looking towards nose; also rotates internally.
- CN 3 (Oculomotor)
 - All other muscles of eye movement – also raises eye lid & mediates pupillary constriction.

CNs & Muscles That Control Extra Ocular Movements

LR- Lateral Rectus

MR-Medial Rectus

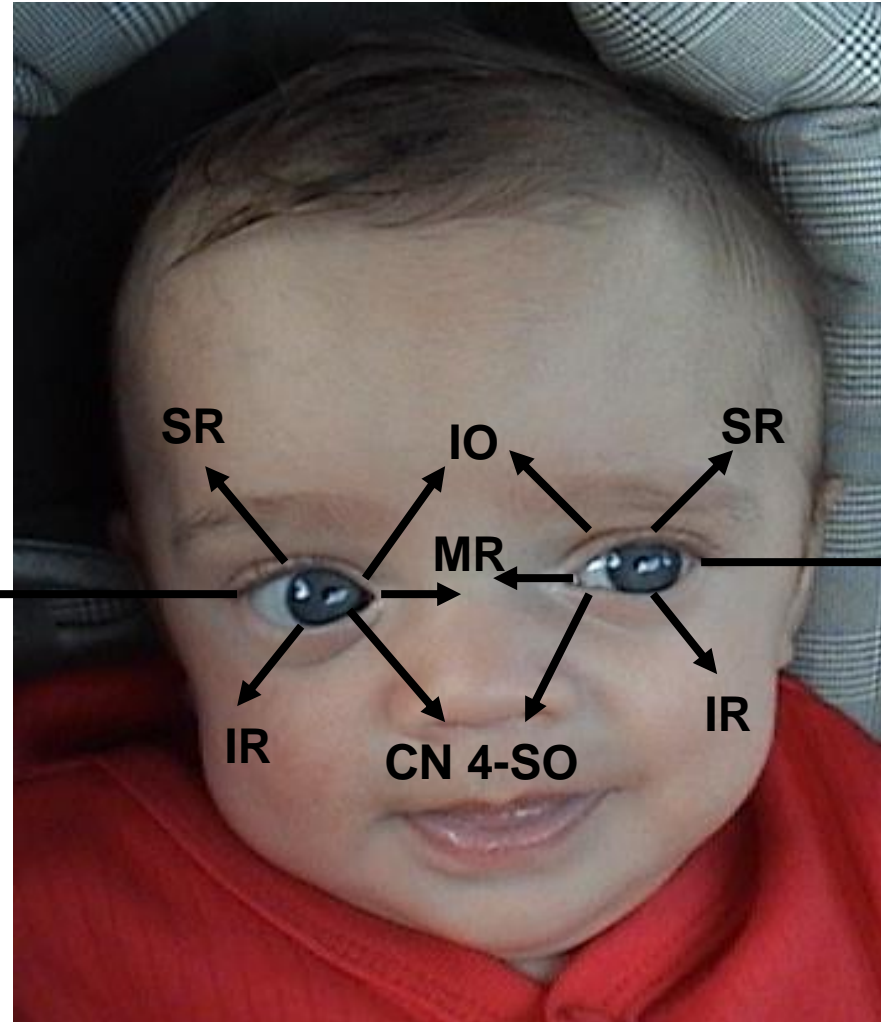
SR-Superior Rectus

IR-Inferior Rectus

SO-Superior Oblique

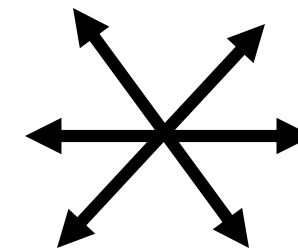
IO-Inferior Oblique

CN 6-LR



CN 6-LR

CN 4-SO



**6 "Cardinal" Directions
Movement**

SO '4', LR '6', All The Rest '3'

Technique For Testing Extra-Ocular Movements

- To Test:
 - Patient keeps head immobile, following your finger w/their eyes as you trace letter “H”
- Eyes should move in all directions, in coordinated, smooth, symmetric fashion.
- Hold the eyes in lateral gaze for a second to look for **nystagmus**

National MS Society Video










<https://www.youtube.com/watch?v=0cGJiqBn2DM>



Normal Vision **Double Vision**

- Binocular Diplopia: Resolves when close one eye (more serious)
 - Misaligned eyes from impaired extra-ocular movement → causes patient to see two images (i.e. double vision) when look in direction that's affected – Secondary to: CN, Muscle or NMJ disorder
- Monocular: Double vision even with one eye closed (usually local eye process)

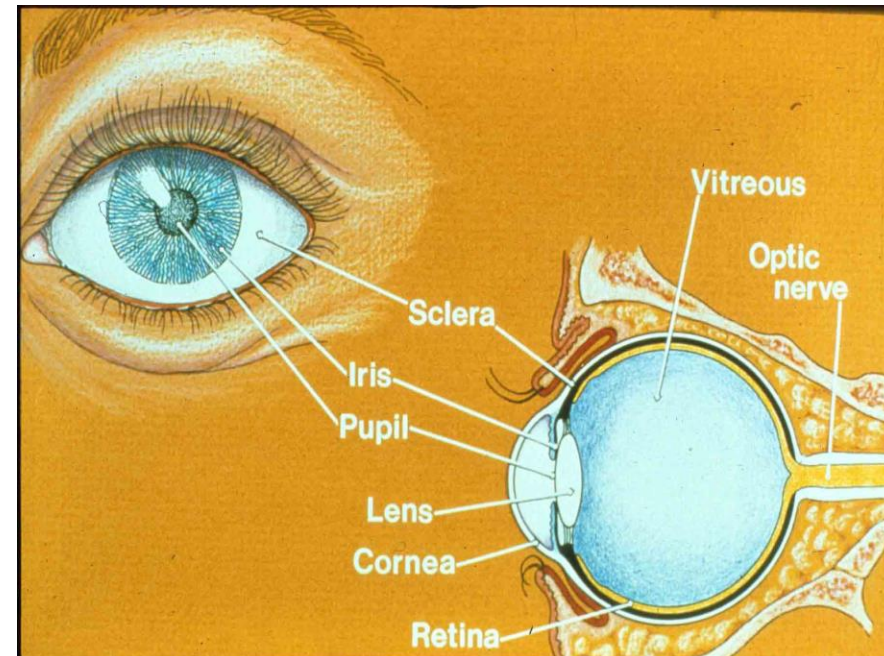
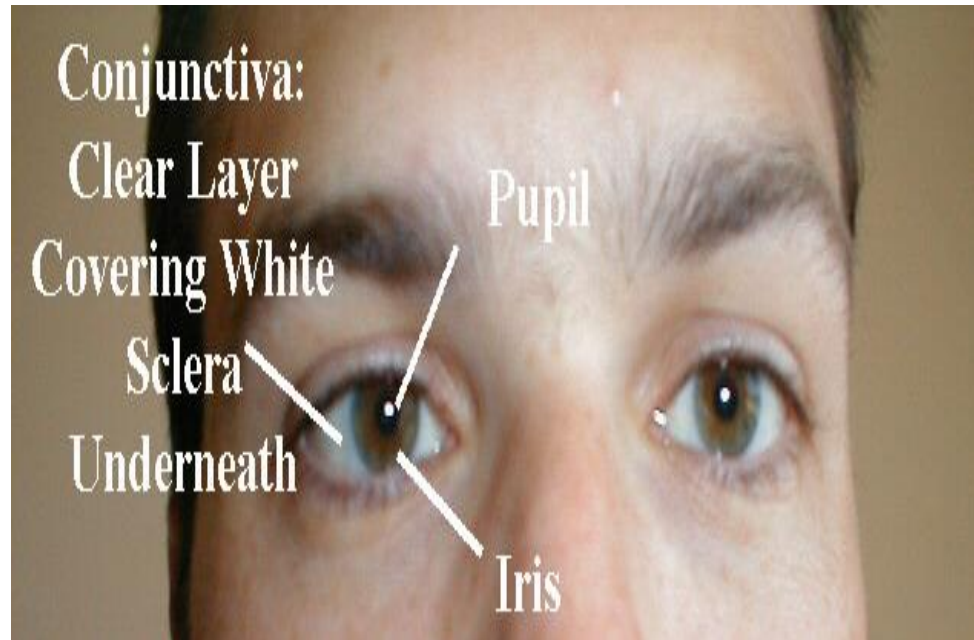
Impaired Movement With CN Palsys

Cranial nerve palsy	Exam findings – evidence of incomitance		
	Direction of gaze ←	Primary position	Direction of gaze →
Right 3rd nerve palsy	 Smaller angle of horizontal squint	 Right eye turns downwards and outwards	 Unable to adduct right eye Larger angle of squint Double vision further apart
Right 4th nerve palsy	 No obvious squint	 Right eye turns upwards and outwards	 Right eye elevates more as it moves medially Double vision further apart
Right 6th nerve palsy	 Unable to adduct right eye Larger angle of squint Double vision further apart	 Right eye turns medially	 Able to adduct right eye No obvious squint

BMJ 2015; 351: h5385
<https://doi.org/10.1136/bmj.h5385>

Observation External Structures

- Pupil, iris and eyelids & lashes should appear symmetric
- Sclera should be white
- Conjunctiva clear



Examples of Asymmetry, Scleral & Conjunctival Abnormalities



Asymmetric Lids and Pupils



Yellow Sclera



Conjunctivitis



Subconjunctival Hemorrhage

Pupillary Response

- Pupils modulate light entering eye (like shutter on camera)
- Dark → dilate; Bright → constrict
- Light impulses travel away (afferents) from pupil via CN 2 & back (efferents) to ciliary muscles controlling dilatation & constriction
 - Parasympathetics along CN3 (constrict)
 - Sympathetics (dilate)
- Pupils respond symmetrically to light in either eye
 - Direct =s constriction in response to direct light
 - Consensual =s constriction in response to light shined in opposite eye

What's Abnormal Here?



Endophthalmitis: Infection within the eye. Acute pain, redness and loss of vision. Profound chemosis (redness and edema of the conjunctiva). Easily visible hypopyon, a white layer of inflammatory cells in the anterior chamber (in front of the iris).

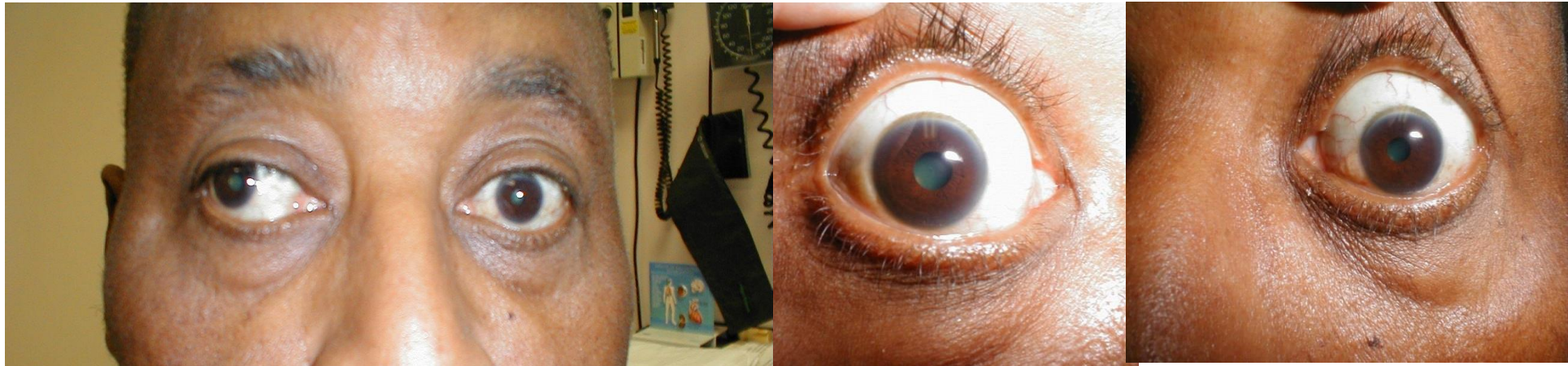
Describing Pupillary Response

- Normal recorded as: **PERRLA** (**P**upils **E**qual, **R**ound, **R**eactive to **L**ight and **A**ccommodation)
 - accommodation = constriction occurring when eyes follow finger towards nose (looking “cross eyed”).

Abnormal Appearing Pupils

- Asymmetric pupils (anisocoria) secondary to:
 - Parasympathetic nervous system dysfunction → e.g. tumor compressing CN3 → pupil dilated (also ptosis, eye down/out)
 - Sympathetic nervous system dysfunction (e.g. Horner's Syndrome) → pupil smaller at baseline (also ptosis)
 - Prior surgery, trauma to pupils, other
- Systemic Meds affect both pupils
 - sympathomimetics (cocaine) → dilate
 - narcotics (heroin) → constrict
- Local meds (e.g. eye drops) can affect just one pupil

Which Eye Has Abnormal Pupil, Lid and Eye Position?



Right Eye

Left Eye

Right CN3 Palsy: Right eye deviated laterally, has ptosis, and the pupil is more dilated than the left eye (loss of parasympathetic input).

Which Eye Has Abnormal Pupil and Lid Position?



Right Sided Horner's Syndrome: Disruption of sympathetic chain (in this case due to right apical lung tumor) → ptosis, miosis (and anhidrosis).

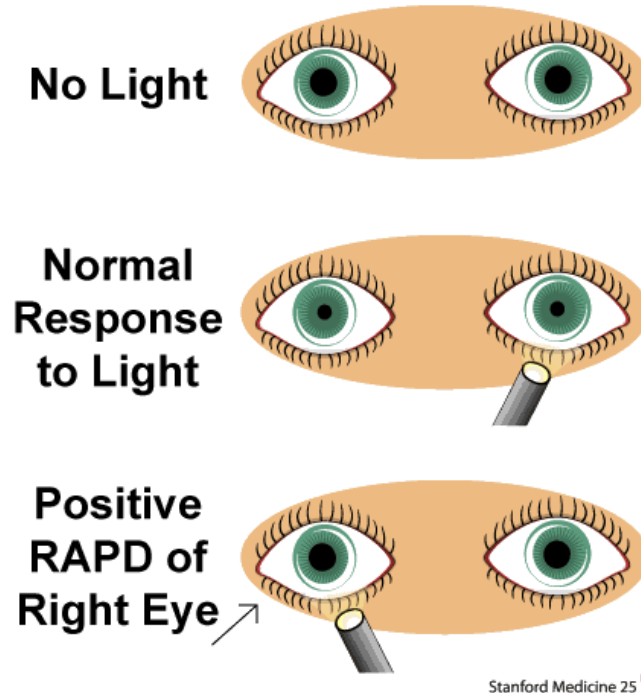
Note right pupil smaller than left
and right eyelid covers more of eye compared with left

Pupillary Response Testing Technique

- Make sure room is dark → pupils dilated – but not so dark that can't observe response
- Shine light in R eye:
 - R pupil → constricts
 - Again shine light in R eye, but this time watch L pupil (should also constrict)
- Shine light in L eye:
 - L pupil → constricts
 - Again shine light in L eye, but this time watch R pupil (should also constrict)

Pupillary Response Testing: Relative Afferent Pupillary Defect (RAPD)

- Swinging Flashlight Test
 - Looks for afferent pupil defect (CN II)
 - Baseline appear normal
 - Move flashlight between left & right eye at steady rate
 - With right afferent defect, pupil appears to dilate when swing light repeatedly from left (normal afferents) → right (abnormal afferents)
- RAPD indicates process affecting Optic nerve (e.g. optic neuritis, stroke, Temporal arteritis)



Corneal Reflex

Sensory CN 5, Motor CN 7

- Pull out wisp of cotton.
- W/patient looking straight ahead, gently brush wisp against the cornea (area in front of the pupil)
- Should cause the patient to blink.
- You don't have to do this on one another.



Making The Most of Ophthalmoscopy

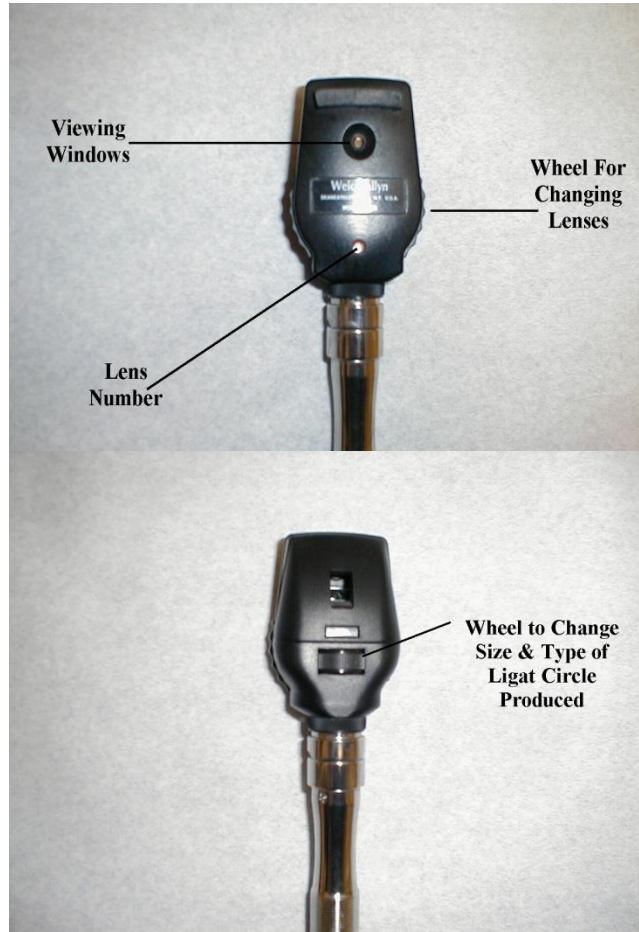
- **Why bother?**
 - Exam reveals evidence **disease localized** to eye
 - Retinal exam gives insight into **systemic** vascular Dz, CNS Dz
- **Difficult skill** – particularly in non-dilated eye – Expect to be **frustrated!**
- **Take time**, have patient @ comfortable height, lights low (so pupils dilate).
- **Closer** you get, the **more** you'll **see** (like looking through a key hole)

Using Your Ophthalmoscope

Standard

Pros: widespread, less \$s

Cons: harder to see things



Panoptic

Pros: easy to use, magnified view

Cons: \$s, less widely available



When using either scope, make sure your battery is charged!

Dr. Campbell Purchased his Oto-Ophthalmoscope 52 Years Ago In Med School - And Still uses It!



Using Your Ophthalmoscope – Standard Scope

Medium circle light, medium intensity

Instruct patient to look towards a distant point (avoid roving)

R eye → R eye

Place hand on shoulder or forehead

Grasp handle near top

Start 15 degrees temporal

Move in slowly – click focus wheel until a retinal structure comes into sharp focus - then eval each quadrant of retina systematically

Usually start with “green” lens number 0. And rotate counter clockwise to the red numbers in order to bring things into focus



Patient usually remove their glasses (contacts ok) to cut down on reflections –
Most examiners find it more comfortable to remove glasses as well

Using Your Ophthalmoscope – Panoptic

Focus sharply on a sign or object 20` away

Set aperture dial to green line

Turn on to max power

Grasp handle near top

Place scope (cushioned side towards patient)
against patients orbit

Look for red reflex – then follow this in to the
retina

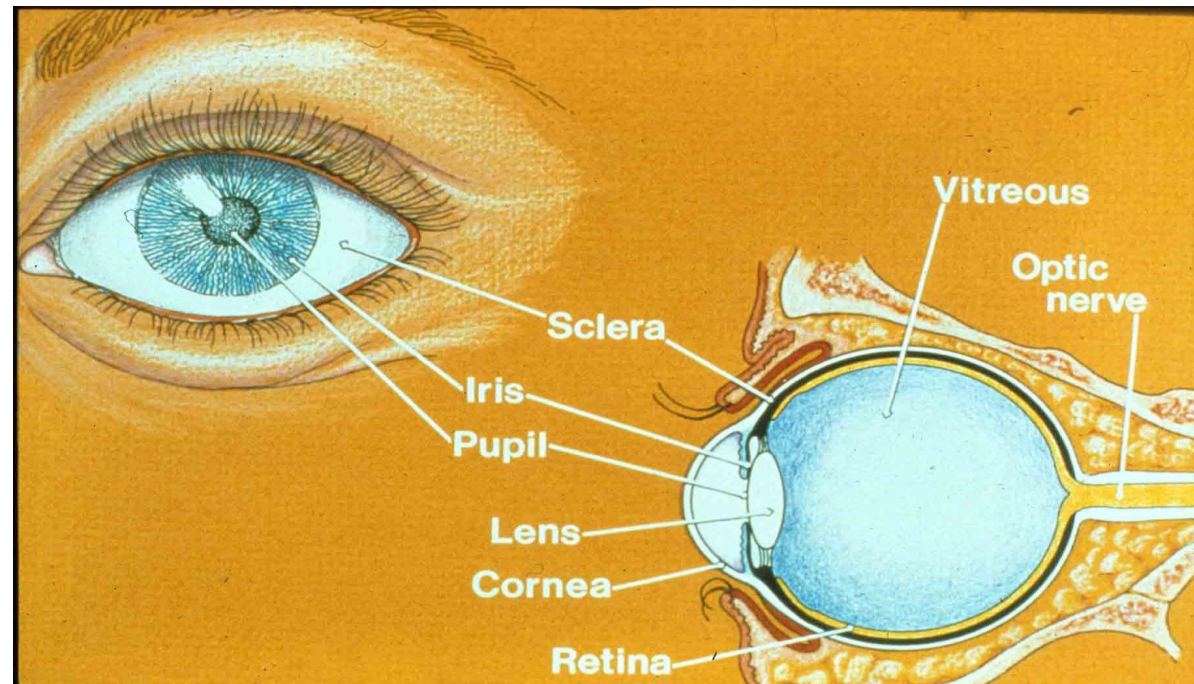
With cushion compressed against patient, retina
should be in view

If you lose the pupil, pull back, find the red reflex
and repeat



Using Your Ophthalmoscope – What You Should See

- Magnified view of surface structures (pupil, iris, sclera, contact lenses)– using ophthalmoscope like a magnifying glass
- To view retina, must see thru intervening structures –
if no obstruction → red reflex when look from a distance @ pupil.



Red Reflex



Viewing The Retina

- @ any time, only 15% of retina visible
- Follow vessels (branches of tree → trunk) → optic disc
- Be systematic:
 - Optic disc
 - Vessels (veins & arteries)
 - Retina (in quadrants)
 - Macula → ask the patient to look @ your light

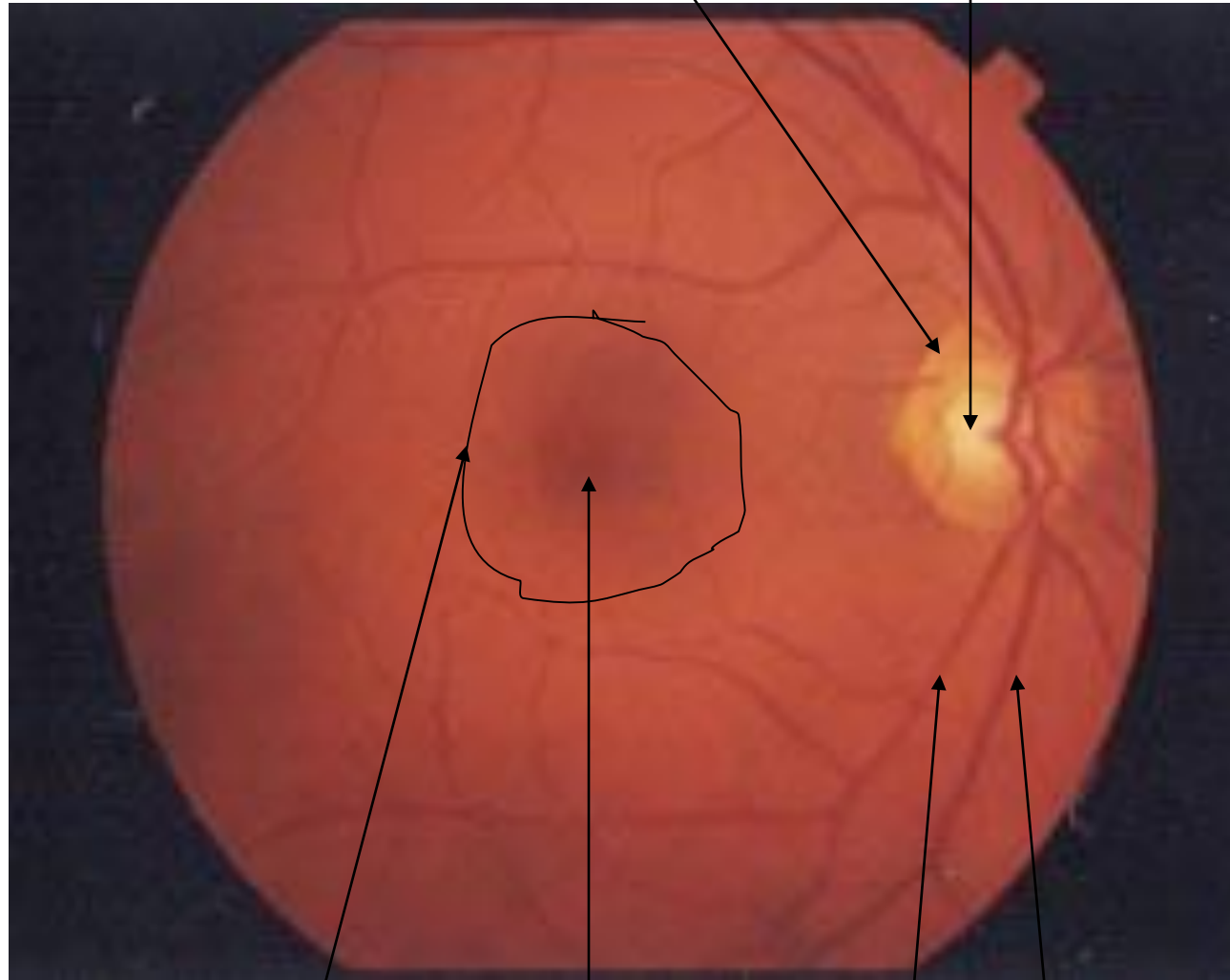
The Retina (fully viewed)

Temporal

Optic Disc

Optic Cup

Nasal



Macula

Fovea

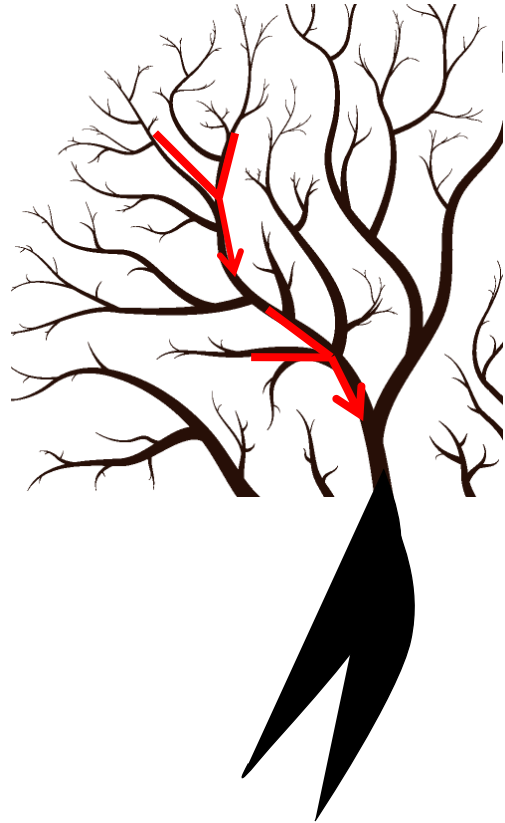
Artery

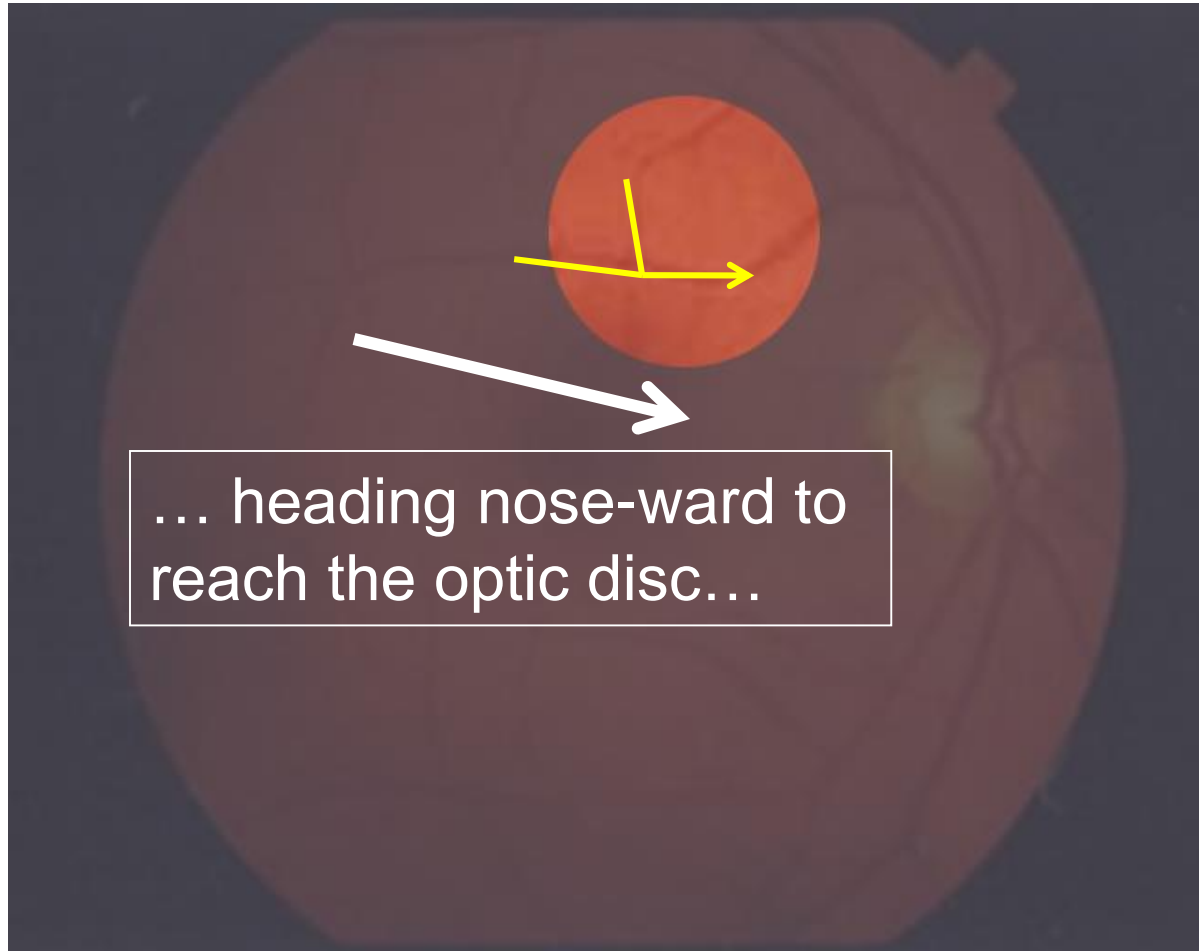
Vein

Structures To Note:

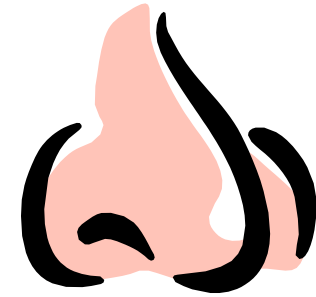
1. Color of retina (orange-ish)
2. Arteries (smaller)
3. Veins (darker)
4. Optic Disc (head of CN2)
5. Optic Cup (center of disc)
6. Macula (sharpest focus) – center = 's fovea

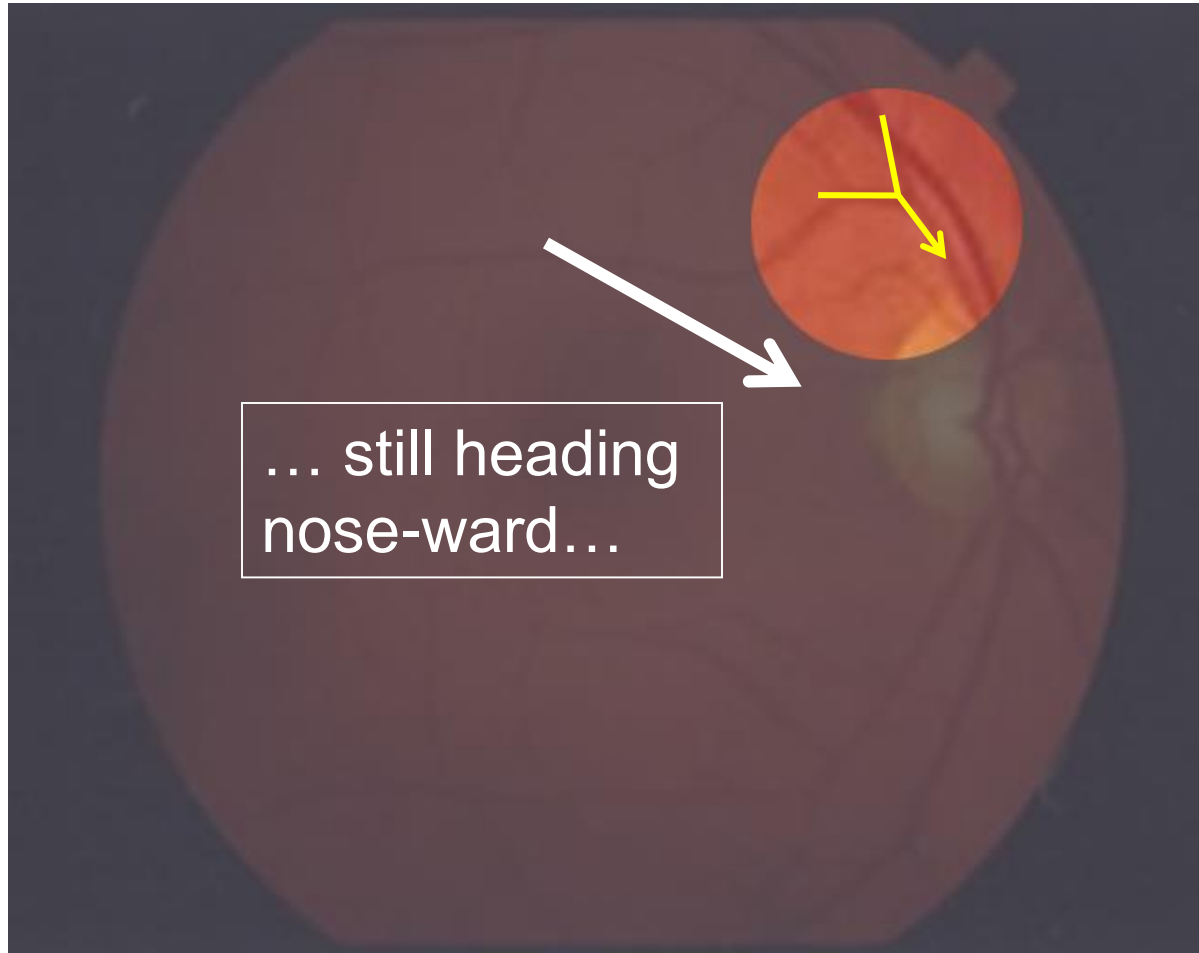
You'll Only Get a Partial View Of the Retina – So, follow the “braches” towards the “trunk”.. They'll point the way to the optic disc..



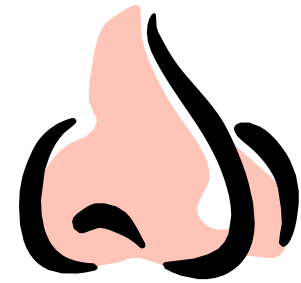


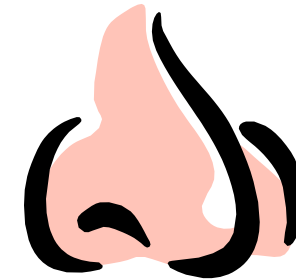
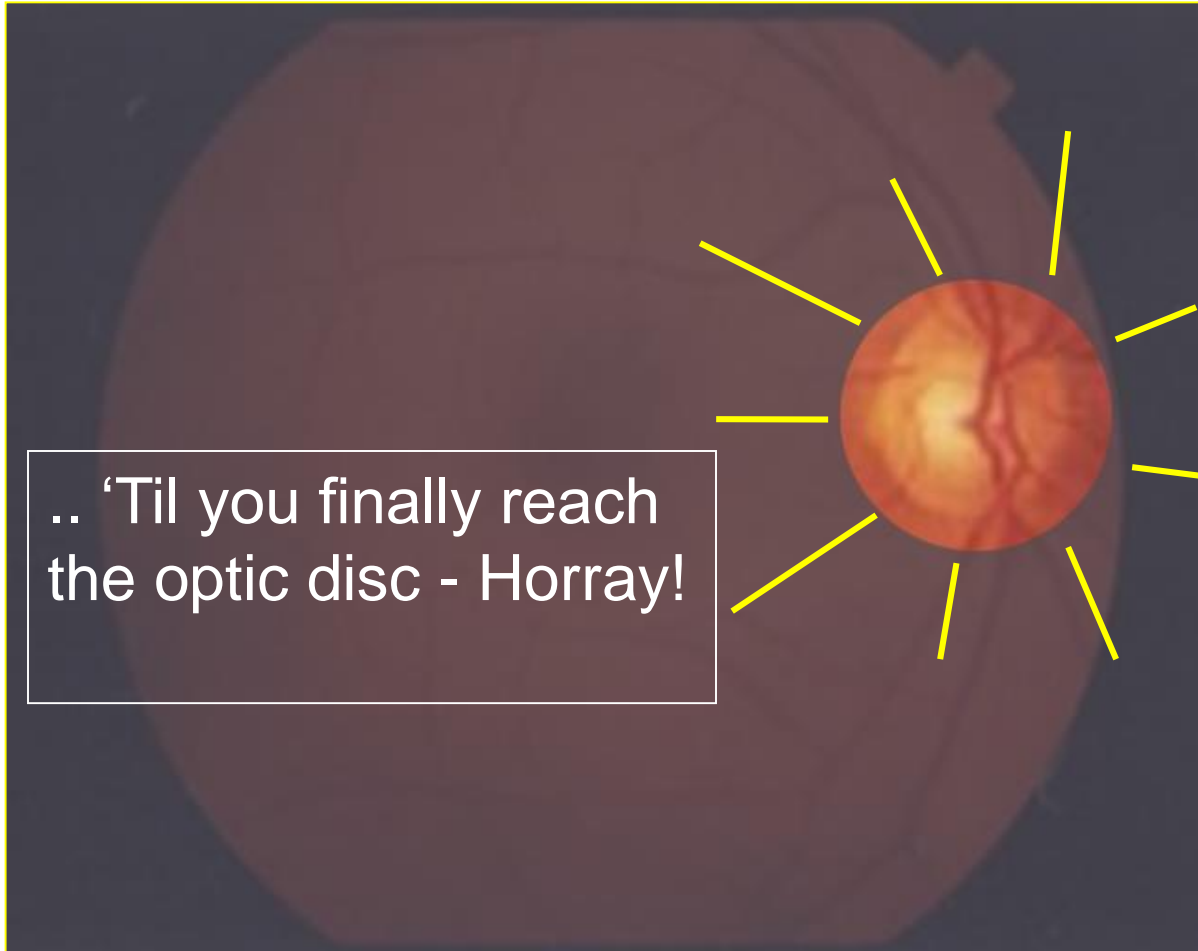
... heading nose-ward to reach the optic disc...





... still heading
nose-ward...





Pathology: Intrinsic Retinal Disease



Normal Retina



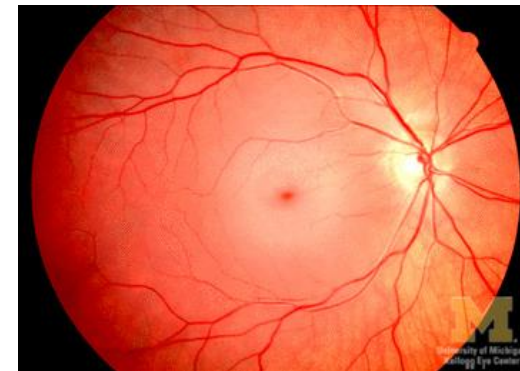
Macular Degeneration

<http://eyepathologist.com>



Retinal Detachment

<http://www.kellogg.umich.edu/theeyeshaveit/index.html>

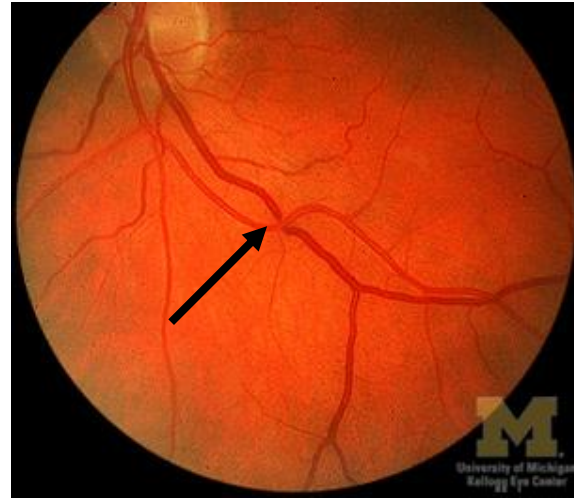


Retinal Artery Infarct

Retinal Pathology – In-*Sight* Into Disease Elsewhere



Normal Retina



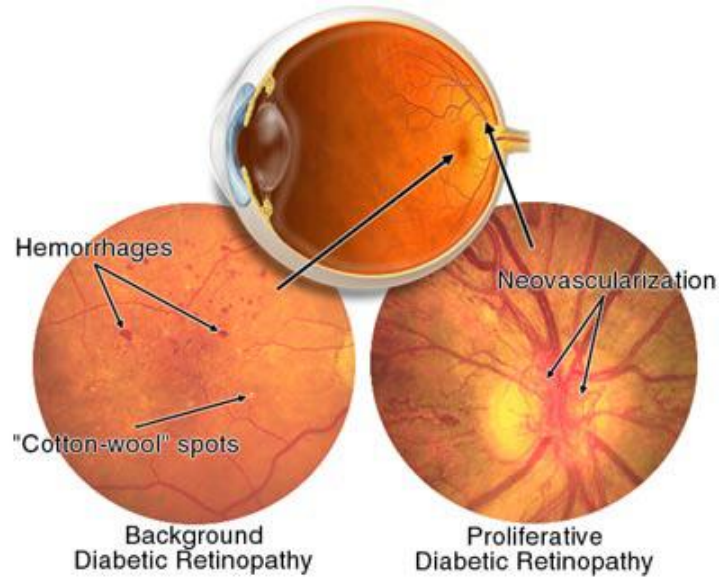
A-V Nicking



Arteriolar Copper-Wiring

Chronic Systemic Hypertension

<http://www.kellogg.umich.edu/theeyeshaveit/index.html>



Diabetic Retinopathy – Marker of Systemic Microvascular Disease

<http://www.diabetesandrelatedhealthissues.com/>



Papilledema – Increased Intracranial Pressure

<http://www.familyoptometry.com>

Additional Eye Exam Learning Resource

- New England Journal of Medicine video and text that reviews the basics of ophthalmoscopy.
- <http://www.nejm.org/doi/full/10.1056/NEJMvcm1308125>

Summary of Skills

- Wash hands
- Visual acuity (hand held card)
- Visual fields (confrontation)
- Extra ocular movements
- Examine external eye structures (lid, sclera, pupil, iris, conjunctiva)
- Pupillary response to light – direct and consensual
- Corneal reflex
- Red reflex
- Retinal exam



Time Target: < 10 minutes

