Pupils
Really isn’t it just a hole!

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Disclosures
Nothing to disclose.

Learning Objectives
• Better understanding of Pupil structure and function
• Increase your ability to test pupillary function
• Understand how to record non normal pupil function

Anatomy
Anatomy

- The Iris has two muscles: the dilator muscle and constrictor muscle.
- The dilator muscles are arranged radially much like spokes on a wheel.
- The constrictor muscle runs circularly around the pupil border.

How does it work

- Light activated reflex and accommodation activated reflex all wired through the mid brain, with fibers split between the Optic Nerve (CN2) and Oculomotor nerve (CN3).
- Fibers are part of the sympathetic and parasympathetic pathways.
  - Sympathetic: Dilates the eye and gets you ready to fight or run!
  - Parasympathetic: Constricts the pupil activates ciliary muscle for accommodation and settles you down.

How do you test it?

- First set the mood!
  - You want just enough ambient light in the room so that you can see both pupils. This means you will need more light for a very dark iris and less light for a light iris.
- Second, you need a Big Target "E"
- Third, grab your favorite light! Choose wisely!
  - penlight, transilluminator, O scope, or the BIO.
  - You want something that will give you a concise circle of light with uniform illumination.
  - So no flash lights to much spread.

How does it work

- When the Constrictor muscle is activated what happens to the pupil size?
- When the Dilator muscle is activated what happens to the pupil size?
- What happens to the pupil size when looking at a near object?
How do you test it?

- Hold your light within 25cm of the patient, do not block the line of sight.
- Have the patient remove their glasses and direct their gaze to the big E.
- Shine the light into their right eye and observe the size and speed of the pupillary constriction. (Direct response)
  - Repeat twice
- Now adjust your observation to the left eye and shine the light into the right eye and observe the size and speed of the pupillary constriction. (Consensual response)
  - Again repeat twice
- For the left eye repeat all the same steps

Swinging Flashlight test

- Move the light between the eyes rapidly (watch out for the nose) spending about 3-5 seconds on each eye.
- Observe the response (dilation or constriction) and the size of each pupil at the moment when light first arrives and during the 3-5 second observation period
- Make sure you are directing the light onto the same part of the retina in each eye and that the light is of equal intensity.
- Repeat for two to three complete cycles.

What are you looking for?

- Are the pupils round?
- Are the pupils equal in size?
- Is there a Direct and Consensual response?
- Is there any pupillary escape?

If normal record as Pupils Equal Round Reactive to Light, no Relative Afferent Pupillary Defect or PERRL-RAPD

Pupils of unequal size

- You find that there is a 1mm difference between the eyes in dim and bright light. Great record as "anisocoria equal in dim and bright OD>OS by 1mm" (old photos back it up as well)
- You find that there is a difference in pupil size depending on the light, you have more to do!
  - Have the patient look straight ahead and measure the palpebral aperture, note the position of the lids relative to the limbus.
  - Now have the patient follow your finger to up-gaze, observe when the limbus clears the lower lid and measure the palpebral aperture in up-gaze.
- Record Pupils in bright OD=3.5mm, OS 3mm/in dim OD=7.0mm, OS 4.5mm/+ptosis upper lid OS

What Does it mean?

- Anisocoria more pronounced in dim light with mild ptosis of the upper and lower lid in the eye with the smaller pupil.
  - This is Horner's Syndrome and the most likely location for the issue is where?
    - Upper chest lesion

Photo credit: Steve Kofron
What Does it mean?

- Anisocoria more pronounced in bright conditions with a ptosis in the eye with the larger pupil.
- This is CNIII lesion, the affected eye is most likely pointed down and out.

Those pupils are failing all these tests, what now?

- Accommodative testing:
  - Tools:
    - Big “E”
    - Near target (something containing fine visual detail)
- Starting with the patient looking at distance and holding the near target at 10cm.
  - Have them look at the near target, observe the pupil measuring briskness of response and magnitude.
  - Have them look back at distance to check for dilation
  - Repeat to confirm
  - Record by adding A the PERRL (PERRLA)
- or OD unresponsive to light direct and consensual; both pupils constrict to near; OS responds to light D&C.

That pupil does not look normal.

How would you record these finding?

- Recommended reading resource: “Clinical Procedures for Ocular Examination” by N. Carlson and D. Kurtz.