

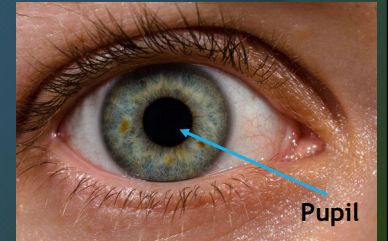
## Pupillary Assessment

OOS Skills Workshop

Special Thanks to the Cincinnati Eye Institute Education Department and EyeCare Partners Training Team

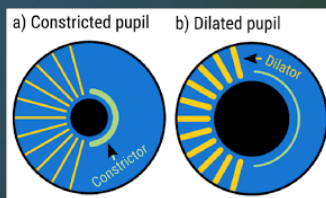
### What is the Pupil?

- The pupil is a hole located in the center of the iris of the eye that allows light to enter the eye, and allows the image to strike the retina.
- Random fact: the plural of iris is irides.



### What is the Iris?

- As unique as your fingerprint
- The iris consists of two muscles:
  - a) Iris Sphincter, circular, constricts the pupil
  - b) Iris Dilator, radial muscles, dilate the pupil



### Heterochromia


- A condition in which each iris is a different color.



## Pupillary Assessments

**Abnormal Eye Exam**

- Pupils**
- Equal**
- Round**
- Reactive to Light and Accommodation**




Not of equal size

Not round

Not reactive to light

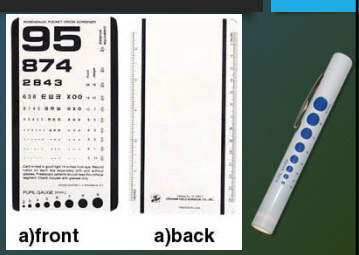
Not accommodating to focus on objects near or far



PERRL or PERRLA?

## Pupillary Assessments


- Measured:
  - With glasses off
  - Lights off/dim
  - Measure with a mm ruler
  - Document: size, shape, reaction of EACH eye



a)front a)back

## Size?


- Measure with a mm ruler or pupil gauge
- Size in DIM light in EACH eye
- Size in BRIGHT light in EACH eye



a)front a)back

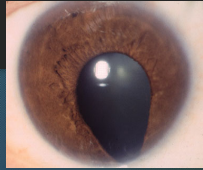
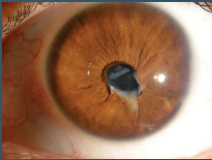
## Equal?

- Are the pupils equal in size?
- Two different pupil sizes are referred to as anisocoria.



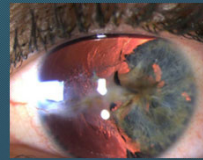
## Shape?

- Is the pupil round?
- Is the pupil irregular?



## Wait... Where is the Pupil?

**Traumatic Aniridia:**  
Traumatic loss or damage to the iris.



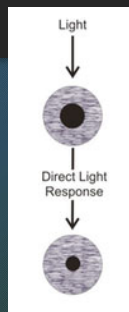
**Congenital Aniridia:**  
Complete or partial absence of the iris.



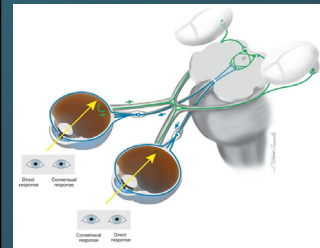
## Reaction?

• **Direct Response-** Shine the light in one pupil and the pupil should constrict.

• **Consensual Response-** What one pupil does, the other should follow. Shine the light in one pupil and observe the opposite pupil to see if it constricts as well.



## Reaction?



**Afferent Pathway- (green)** Visual pathway from the eye to the brain. (Notice that the information is transmitted from the eye to the brain through the optic nerve (CNII).

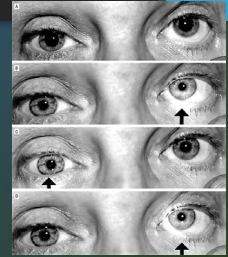
**Efferent Pathway- (blue)** Visual pathway from the brain to the eye. (Notice that the efferent pathway is returned through the oculomotor nerve (CNIII).

## What are we REALLY Assessing during a Pupil Exam?

- The iris?
- The pupils?
- Or...
- The retina
- The optic nerve

## APD- Afferent Pupillary Defect?

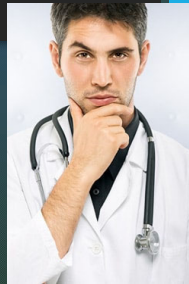
- An APD is a *comparative* response between the two eyes.
  - How is one retina functioning compared to the other?
  - How is one optic nerve functioning compared to the other?
- By performing the *swinging flashlight test*, this allows us to assess if both eyes are perceiving the same amount of light.
- AKA Marcus Gunn Pupil



## APD- Afferent Pupillary Defect

Be suspicious of an APD if:

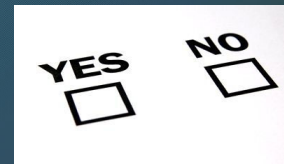
1. Direct response is sluggish
2. Visual acuity in one eye is much worse than the other eye
3. History of retina or optic nerve damage, especially if one eye noted as worse than the other



## RAPD- Relative Afferent Pupillary Defect

Common Questions:

1. Can you have a RAPD in both eyes?





## APD's are only in one eye

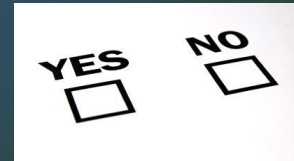
- The answer is NO.
- Remember, an RAPD is a COMPARATIVE response between the two eyes.
- If there was a RAPD in BOTH eyes, they would cancel each other out.



## RAPD- Relative Afferent Pupillary Defect

Common Questions:  
2. Can a RAPD go away?

Let's think about this.....



## Yes, a RAPD can disappear

- The answer is YES!
- If the patient is treated for the problem causing the RAPD, it could go away once the problem is resolved.
- Is there any other way an APD could go away?
- Remember, it is a COMPARATIVE response.....
- YES! What if the condition worsens in the fellow eye?



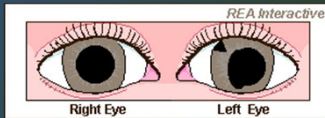
## APD Video



*Video courtesy of Karl Colnik, MD*

## Reverse APD

- We can still assess if a patient has an APD if they have one non-reactive pupil by performing the swinging flashlight test.
- This is achieved by the use of consensual response.



## Is Hippus Normal?

- Yes!
- Hippus is a spasmodic, rhythmic, but regular dilating and constricting pupillary movements between the dilator and sphincter muscles respectively.
- <https://www.youtube.com/watch?v=IBYNUTpRsUw>

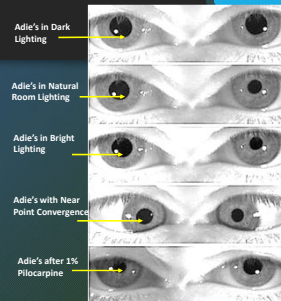
## Adie's Tonic Pupil

### Stays dilated with **bright** light:

- One or both pupils are abnormally dilated (mydriatic) with delayed constriction in response to exposure to light

### But constricts with accommodation:

- There is a rapid/normal reaction of pupillary constriction when looking at a near object, but dilation is markedly slow when the patient shifts to look at a distant object.
- Caused by damage to the ciliary nerves



## Horner's Syndrome

- Anisocoria (always worse and more noticeable in the dark).

### Stays constricted in the **dark**:

- If one pupil will be miotic, check that same eye for upper lid ptosis
- This can occur on its own or from a disorder that disrupts nerve fibers connecting the brain with the eye.



## Horner's Syndrome Signs/Symptoms

- Associated with:
  - Ptosis
  - Miosis
  - Anhidrosis: Lack of perspiration on the affected side



## Q1. The pupil evaluation includes?

- A. Size, shape and reaction to light
- B. Iris color, roundness, and reaction to light
- C. Angle depth, iris diameter, reaction to light
- D. Reaction to cycloplegia, light, and accommodation

## A1. The pupil evaluation includes...

- A. Size, shape and reaction to light

## Q2. Unequal pupil size is termed:

- A. Anisometropia
- B. Anisochromia
- C. Aniseikonia
- D. Anisocoria

A2. Unequal pupil size is termed...

D. Anisocoria

Q3. Testing of the consensual pupil reaction response eyes consist of?

- A. Each pupil reacts to light independently
- B. If there is a direct pupillary reaction to light, the other pupil reacts with it.
- C. The pupils react to light in reverse order
- D. The pupils react to near stimuli independently

A3. Testing of the consensual pupil reaction response eyes consist of...

B. If there is a direct pupillary reaction to light, the other pupil reacts with it.

Q4. When checking consensual pupil responses to light, all of the following should be done *except*:

- A. Dim the room lights
- B. Have the patient look at a distant object
- C. Shine the light source straight into the pupil of ONE eye
- D. Cover the eye not being tested



A4. When checking consensual pupil responses to light, these 3 things should be done:

- A. Dim the room lights
- B. Have the patient look at a distant object
- C. Shine the light source straight into the pupil of ONE eye

**But not...**

- D. Cover the eye not being tested

Q5. Constriction of the pupil can be accomplished by any of the following *except*:

- A. Shining a bright light into the eye
- B. Having the patient focus on a near/close-up object
- C. Having the patient focus on a distant object
- D. Using a miotic eye drop, such as Pilocarpine

A5. Constriction of the pupil can be accomplished by any of the following:

- A. Shining a bright light into the eye
- B. Having the patient focus on a near/close-up object
- D. Using a miotic eye drop, such as Pilocarpine

However, it would dilate if you

- C. have the patient focus on a distant object.

Q6. To evaluate a patient for tonic pupil (or Adie's tonic pupil), one would use which method?

- A. Pupillometer
- B. Slit-lamp evaluation
- C. Cycloplegia
- D. Accommodation response test

A6. To evaluate a patient for tonic pupil (or Adie's tonic pupil), one would use which method?

D. Accommodation response test

Q7. A relative afferent pupillary defect (RAPD) is identified by using the:

- A. Cross cover test
- B. Pupillometer
- C. Swinging flashlight test
- D. Direct flashlight test

A7. A relative afferent pupillary defect (RAPD) is identified by using the:

C. Swinging flashlight test

Q8. You might first suspect that the patient has a tonic pupil when:

- A. The response to direct light is slow
- B. The pupil enlarges in direct light
- C. That eye also has a ptotic lid
- D. The patient is photophobic

A8. You might first suspect that the patient has a tonic pupil when:

- A. The response to direct light is absent or slow

Q9. Which of the following is associated with ptosis, miosis, and lack of perspiration (anhidrosis) on the affected side?

- A. Adie's tonic pupil
- B. Horner syndrome
- C. Argyll Robertson pupil
- D. Marcus Gunn pupil

A9. \_\_\_\_\_ is associated with ptosis, miosis, and lack of perspiration (anhidrosis) on the affected side.

- B. Horner's Syndrome

Q10. Another name for a RAPD is:

- A. Argyll Robertson pupils
- B. Adie's syndrome
- C. Marcus Gunn pupil
- D. Tonic pupil

A10. Another name for a RAPD is:

C. Marcus Gunn pupil



## Sample Standard Operating Procedure Pupillary Assessment

Pupillary assessment includes (1) measurement of pupil size (2) response to direct and consensual light (3) checking for RAPD (Relative Afferent Pupillary Defect).

1. Turn off room lights.
2. Instruct patient to fixate on a distance target.
3. Instruct patient to tilt head slightly downward, while shining light from transilluminator from below and indirectly without invoking pupillary response, measure the dim light pupil size in each eye.
4. Shine light from transilluminator directly at each eye separately while checking the following:
  - Direct response: Reaction of the pupil in which you are shining the light.
  - Consensual response: Reaction of the fellow eye.
  - Size of the constricted pupil in the bright light.
  - Shape of the pupil (round, oval, irregular, etc)
5. Assess whether there is RAPD (Relative Afferent Pupillary Defect) "swinging flashlight test."
  - a. Shine light of the transilluminator into one pupil. Observe constriction, if present. Hold for 1-2 seconds.
  - b. Shift the light quickly into the other pupil going straight across the bridge of the nose.
  - c. Shine light of the transilluminator into the other eye and hold for 1-2 seconds.
  - d. Repeat "swing" several times.
    - If there is no RAPD, both pupils should constrict (or remain constricted) upon reaction to light introduced in the first eye, a normal result would be no reaction (or slight constriction) when shining into the second or fellow eye.
    - If RAPD is present, the technician will see the pupil dilate in the eye which has RAPD present when the light shifts to that eye (the pupil will constrict when the light is introduced to the eye without RAPD).
6. Document results in the patient's chart.