Anisocoria ~ Now What?

Richard Mangan, OD, FAAO
The Eye Center of Richmond
Adjunct Faculty, IU School of Optometry

Anisocoria Case Report

- 55 yr. Old caucasian female
- CC: droopy eyelid OD for 1 month, no other complaints or symptoms.
- Patient & Family Ocular & Medical Hx – Negative
- Medications: Evista, Calcium Sup.

Anisocoria Case Report

- Clinical Findings:
  - BVA: 20/20 OD, OS
  - Pupils:
    - (-) APD
    - Size (light): 2.5mm OD, 3.0mm OS
    - Size (dim): 3.0mm OD, 6.5mm OS
    - Normal Near Response
  - EOM’s / CT: Normal

Anisocoria Case Report

- Clinical Findings Continued:
  - Lid Eval:
    - UL 2mm on cornea OD; IPF 5mm
    - UL 1mm above cornea OS; IPF 8mm
    - LL elevation OD
  - Iris Color Equal

Anisocoria Case Report

- Clinical Findings Continued:
  - TA: 10/12
  - SLE: Normal
  - DFE: C/D: 0.2 OD, 0.2 OS
    - (good color)
  - Macula & Retina: Normal OU
Q1: Which of the following tests is least appropriate to confirm the diagnosis?
1. 4-10% Cocaine test
2. .125% Pilocarpine test
3. Paradrine 1% test
4. All of the above
5. None of the above

Q2: Which of the following is the most likely diagnosis?
1. Congenital Horner's Syndrome
2. Acquired Horner's Syndrome
3. Adie's Tonic Pupil
4. CN III Palsy
5. Argyll-Robertson Pupil

Q3: Which of the following is NOT considered appropriate management for this condition?
1. Chest X-Ray
2. Brain Imaging
3. Referral to a Neurospecialist
4. All of the above are appropriate
5. None of the above are appropriate

Q4: Which of the following indicates the congenital / infantile form of this condition?
1. Mild Ptosis with excellent levator function
2. Miotic Anisocoria, most apparent in darkness
3. Lower Lid Elevation
4. Ipsilateral Anhydrosis
5. Heterochromia

Q5: Which of the following requires the least aggressive work-up?
1. Central / Pre-ganglionic Lesion
2. Post-ganglionic Lesion

The Pupil
- Anatomical Considerations
  - Pathway of the Pupil Light Reflex
    - Parasympathetic Pathway (Sphincter Muscle)
      - 4 Neuron Arc (afferent + efferent)
    - Sympathetic (Dilator Muscle of the Iris)
      - 3 Neuron Arc
Pupil Examination Basics

Pupil Examination...

...Be Systematic

- What are the BCVA’s? ...And are the acuities equal either corrected or with pinhole?
- Are the patients pupils equal in size in bright and dim illumination?
- If not, is the anisocoria > in dim or bright illumination?
- Is the near accommodative reflex present and equal in both eyes?
- Are the accommodative amps = OU?

Pupil Examination (Cont.)

- If the pupils are equal in size, is the direct light reflex equally strong in both eyes?
- Is the consensual light reflex equally strong in both eyes?
True or False?
- A Cataract can cause an APD?
  - FALSE...If you are finding an APD, check your illumination source first.
  - If you still have a + APD, need to find other cause.

YES or NO?
- Is it possible to have optic nerve disease and NOT have an APD?
  - YES...if the disease is bilateral & EQUAL in BOTH eyes (i.e., toxic optic neuropathy)

True or False?
- Macular Degeneration can cause an APD?
  - TRUE...If the Macular Degeneration is unilateral & severe enough (Va +/- 20/400)

True or False?
- Visual Acuity does not necessarily correlate with an RAPD?
  - TRUE...a person with end-stage glaucoma can have an APD with good central acuity.

True or False?
- Only one functional pupil is needed to determine the presence of an APD?
  - TRUE...because of the consensual light response.
  - Good example at www.richmondeye.com
Is PERRLA Enough?

<table>
<thead>
<tr>
<th>Iris Color</th>
<th>Pupil Size</th>
<th>D&amp;C Reflex</th>
<th>Accom Reflex</th>
<th>Pupil Shape</th>
<th>APD</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>Green</td>
<td>4 =&gt; 7</td>
<td>3D / 3C</td>
<td>2+</td>
<td>R</td>
</tr>
<tr>
<td>OS</td>
<td>Green</td>
<td>4 =&gt; 7</td>
<td>3D / 3C</td>
<td>2+</td>
<td>R</td>
</tr>
</tbody>
</table>

PER (3:6) RL (3+) A (++)

Identifying & Recording:

**Exam Clinical Pearls**

- Ø PERRLA
- BIO > Transilluminator > Penlight
- Neutral Density Filters
- Fat Scan

Normal Pupillary Phenomena

- Pupillary Unrest vs. Hippus
- Near Synkinesis (The Near Triad)
- Direct & Consensual Responses
- APD / Marcus Gunn Defect
  - [www.richmondeye.com](http://www.richmondeye.com)
  - Physiological Anisocoria

Anisocoria: Case History

- Temporal Aspects?
- Eye Pain?
- Decreased VA?
- Arm, Chest, Head, or Neck Pain?
- Nuchal Rigidity?
- Hx of Stroke, Cancer, or Surgery
- Diplopia?
- Hx of Trauma?
- Drops or Ung's?
- Current Medications (including OTC's)?
- STD's, Shingles, MS, Thyroid Disease, Diabetes?
- Alcohol Usage?

Anisocoria: Exam Techniques

<table>
<thead>
<tr>
<th>Power of density filter</th>
<th>Amount of light transmitted</th>
<th>Filter Factor</th>
<th>Number of aperture steps in group</th>
</tr>
</thead>
<tbody>
<tr>
<td>ND 0.5</td>
<td>0.95%</td>
<td>1</td>
<td>1000</td>
</tr>
<tr>
<td>ND 0.5</td>
<td>0.95%</td>
<td>1</td>
<td>1000</td>
</tr>
<tr>
<td>ND 0.6</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>ND 0.7</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>ND 0.8</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>ND 0.9</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>ND 1.0</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>ND 1.1</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>ND 2.0</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>ND 3.0</td>
<td>0.9%</td>
<td>2</td>
<td>200</td>
</tr>
</tbody>
</table>

www.richmondeye.com
Anisocoria: Exam Techniques
- VA's
- External
  - Ptosis
  - Anhydrosis
- EOM's
- Color VA, Red Desaturation
- SLE & Tonometry
- Pupillary Assessment:
  - Iris Color
  - Pupil Size(s) & Shape
  - Reactivity
  - Dilation Lag
  - Near Response
  - Vermiform Changes
- VF Testing & DFE

Which is the Abnormal Pupil?
- The pupil that reacts sluggishly to light
  - If Aniso > in Bright => Larger Pupil
    - Parasympathetic Denervation
  - If Aniso > in Dim => Smaller Pupil
    - Abnormal Sympathetic Innervation

DDX of Anisocoria
- P = Physiological
- A = Adies Tonic
- T = Third N. Palsy
- H = Horner's
- I = Iritis
- C = Congenital Malformation / Coloboma

Anisocoria: Need to Rule-out!
- Larger Pupil is ABN
  - Adie's Tonic Pupil
  - Compressive III N.
  - Pharmacological
- Smaller is ABN
  - Horner's Syndrome
  - Argyll-Robertson
  - Pharmacological

Physiologic Anisocoria
- Anisocoria of < 1mm (to 2mm)
- 20% of the US Population has Simple or Physiological Anisocoria.
- The degree of anisocoria can vary from day to day and even switch sides.
Adie’s Tonic Pupil

Stats
- Females 3:1
- Age: 20–40
- 80% Unilateral Initially
- Becomes bilateral at rate of 1-4% / year
- Etiology
  - Idiopathic vs. Viral

Key Findings
- Dilated pupil with poor to absent direct & consensual response.
- Tonic near responses
- Reduced Accom Amps
- Look for segmental palsy of Iris sphincter muscle

Additional Testing
- Dilute (0.125%) Pilocarpine
  - Denervation Supersensitivity
  - Parasympathetic defect occurs AFTER the fibers leave the Ciliary Ganglion.
  - Exaggerated Pupillary Constriction
- Deep Tendon Reflexes
  - Diminished Response => Holmes-Adies Syndrome

Isolated Third N. Palsy w/ Pupil Involvement
- Normal Room Illumination
- Poor Direct Response
- Poor Consensual
- (+) Near Response After Prolonged Effort
Isolated Third N. Palsy w/ Pupil Involvement

- Sudden Onset Unilateral Ptosis with Eye or Head Pain
- Acuity is Typically Unaffected unless damage in Superior Orbital Fissure
- Eye is in non-comitant exotropic & hypotropic position (“down & out”)

Isolated Third N. Palsy

- Posterior Communicating Artery Aneurysm (*Most Common*)
- Uncal Herniation Syndrome
  - Space Occupying Lesion
  - Subdural Hematoma
- Pituitary Apoplexy
- Ischemic Vascular Disease (Rare)

Isolated Third N. Palsy w/ Pupil Involvement

- Management
  - Hospital Neurosurgical Consult ASAP
  - CT/MRI/MRA
  - Lumbar Puncture
  - Cerebral Angiography
Horner’s Syndrome

**Anatomy of the Sympathetic Pathway to the Eye**

**Horner’s Syndrome: Clinical Features**

A. Moderate Ptosis (2-3mm) due to paralysis of Muller’s muscle
B. “Upside Down Ptosis” - Mild elevation of the lower lid due to paralysis of the smooth muscle attached to the inferior tarsal plate.
C. Apparent Enophthalmos due to A & B above
D. + Dilation Lag (classic finding)
E. Decreased IOP on affected side

**Horner’s Syndrome: Localization of Lesion**

- 4% Cocaine
  - + Test => Anisocoria will increase
- Hydroxyamphetamine (Paradrine 1%)
  - Preganglionic lesion => YES dilation
  - Postganglionic lesion => No dilation
- If suspect pre-ganglionic lesion => Chest CT or X-ray.

F. Miosis, more noticeable in dim illumination. Note: Pupil rxns to light and near are normal.
G. Anhydrosis on Ipsilateral side of face if lesion is below the Superior Cervical Ganglion => Not a 3rd order neuron.
H. Increase in Amplitude of Accommodation due to unopposed action of the parasympathetic.

**Horner’s Syndrome: Clinical Features...Lastly**

- 4% Cocaine
  - + Test => Anisocoria will increase
- Hydroxyamphetamine (Paradrine 1%)
  - Preganglionic lesion => YES dilation
  - Postganglionic lesion => No dilation
- If suspect pre-ganglionic lesion => Chest CT or X-ray.
Argyll-Robertson Pupil

Clinical Features
- Pupils are small and frequently irregular
- Key Finding: LND Pupil (Remember ARP-PRA)
- Bilateral Asymmetric Pupil Involvement
- VA’s are typically NORMAL
- Poor dilation with Mydriatics

Argyll-Robertson Pupil: Work-up
- As this is a Hallmark Sign for Neurosyphilis, need to rule this out, as well as HIV:
  - FTA-Abs, VDRL
  - Neurological work-up
  - Consider MRI, Lumbar Puncture

Anisocoria Case Report

Clinical Findings:
- BVA: 20/20 OD, OS
- Pupils:
  - (-) APD
  - Size (light): 2.5mm OD, 3.0mm OS
  - Size (dim): 3.0mm OD, 6.5mm OS
  - (-) LND
- EOM’s / CT: Normal

Lid Eval
- UL 2mm on cornea OD; IPF 5mm
- UL 1mm above cornea OS; IPF 8mm
- LL elevation OD
- Iris Color Equal

55 yr. Old caucasian female
- CC: droopy eyelid OD for 1 month, no other complaints or symptoms.
- Patient & Family Ocular & Medical Hx - Negative
- Medications: Evista, Calcium Sup.
Anisocoria Case Report

Clinical Findings
- TA: 10/12
- SLE: Normal
- DFE: C/D: 0.2 OD, 0.2 OS (good color)
- Macula & Retina: Normal OU

Q1: Which of the following tests is least appropriate to confirm the diagnosis?
1. 4-10% Cocaine test
2. .125% Pilocarpine test
3. Paradrine 1% test
4. All of the above
5. None of the above

Q2: Which of the following is the most likely diagnosis?
1. Congenital Horner’s Syndrome
2. Acquired Horner’s Syndrome
3. Adie’s Tonic Pupil
4. CN III Palsy
5. Argyll-Robertson Pupil

Q3: Which of the following is NOT considered appropriate management for this condition?
1. Chest X-Ray
2. Brain Imaging
3. Referral to a Neurospecialist
4. All of the above are appropriate
5. None of the above are appropriate
Q3: Which of the following is NOT considered appropriate management for this condition?

1. Chest X-Ray
2. Brain Imaging
3. Referral to a Neurospecialist
4. All of the above are appropriate
5. None of the above are appropriate

Q4: Which of the following indicates the congenital / infantile form of this condition?

1. Mild Ptosis with excellent levator function
2. Miotic Anisocoria, most apparent in darkness
3. Lower Lid Elevation
4. Ipsilateral Anhydrosis
5. Heterochromia

Q5: Which of the following requires the LEAST aggressive work-up?

1. Central / Pre-ganglionic Lesion
2. Post-ganglionic Lesion

Thanks for your attention 😊