Ocular Examination
FRONT TO BACK
ANTERIOR CHAMBER/AC ANGLE/IRIS

Pathology
Secondary Open Angle Glaucoma(s)
Angle Closure Glaucoma
Examination Tools

- Slit Lamp
  - Angle/anterior chamber evaluation for dilation
- Gonioscopy
- Visante
Anterior Chamber

• The space behind the corneal endothelium and in front of iris
• Filled with aqueous humor

• Contains the drainage system for aqueous humor
  – Measures approximately 1000 microns
Characteristics of an Anterior Chamber

- Average chamber depth of 3.15 mm
- Depth less than 2.5 mm @ risk for closure
  - < 1.5 mm ≈ 75% of closure cases
- Reference: Thickness of optic section at apex of cornea = approximately 0.5 mm
Characteristics of an Anterior Chamber

• Depth greater in myopes than hyperopes
• Depth greater in males than females
• AC depth decreases with age
  – Lens thickens with nuclear sclerosis
  – Shallows by 0.01 mm/year

As we age, more at risk for angle closure glaucoma
Anterior Chamber Assessment

- Depth of chamber
How to assess?

- Slit lamp examination
  - van Herick
  - Spilt limbal (Shaffer)
- Tangential penlight estimation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Ratio of Aqueous Gap/Cornea &lt;angle&gt;</th>
<th>Clinical Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1/2 : 1 &lt;35-45°&gt;</td>
<td>closure improbable</td>
</tr>
<tr>
<td>3</td>
<td>1/2 -1/4 : 1 &lt;20-35°&gt;</td>
<td>closure improbable</td>
</tr>
<tr>
<td>2</td>
<td>1/4 : 1 &lt;= 20°</td>
<td>closure possible</td>
</tr>
<tr>
<td>1</td>
<td>&lt; 1/4:1 &lt;= 10°</td>
<td>Closure more likely with mid-dilatation</td>
</tr>
<tr>
<td>0</td>
<td>Nil &lt;0°</td>
<td>closed</td>
</tr>
</tbody>
</table>

5. A narrow angle, measured by the Van Herick method.
Split Limbal

- Silt lamp
- Allows for measurement of the inferior and superior angles

<table>
<thead>
<tr>
<th>Grade</th>
<th>Angle (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4- to 4+</td>
<td>35-45</td>
</tr>
<tr>
<td>3- to 3+</td>
<td>20-35</td>
</tr>
<tr>
<td>2- to 2+</td>
<td>&gt;10 but &lt;20</td>
</tr>
<tr>
<td>0 to 1</td>
<td>&gt;10</td>
</tr>
</tbody>
</table>

Plane of cornea
Plane of iris
Tangential Penlight Estimation

- Hold DO tangential to iris
- Look for shadow on the nasal side
  - No shadow = wide open angle

<table>
<thead>
<tr>
<th>Width Of Shadow</th>
<th>Angle Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 To 1 mm</td>
<td>4</td>
</tr>
<tr>
<td>1.5 To 2 mm</td>
<td>4- To 3+</td>
</tr>
<tr>
<td>2.5 To 3 mm Or</td>
<td>3</td>
</tr>
<tr>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>3.5 To 4 mm Or</td>
<td>3- To 2+</td>
</tr>
<tr>
<td>&gt;30%</td>
<td></td>
</tr>
<tr>
<td>4.5 To 5 mm Or</td>
<td>2- To 1+</td>
</tr>
<tr>
<td>&gt;40%</td>
<td></td>
</tr>
<tr>
<td>&gt; 5 mm Or &gt;50%</td>
<td>1 To 0</td>
</tr>
</tbody>
</table>

Dr. H. Riley

Grade 4 To 3+

Grade 3- To 2+

Grade 2- To 1+

Grade 1 To 0
Visante ??
Corneal Endothelium Assessment

- Krukenberg’s Spindle

- Guttata
Lenticular Anterior Capsule Assessment

• Pseudoexfoliation
What can go wrong?

• **Anterior chamber**
  – Depth
  – Stuff in it
    • Inflammation
    • Blood
    • Pigment
    • Anterior chamber IOL

• **Anterior chamber angle**
  – “Openness”
    • Dilation issues
  – Stuff in angle structures
    • Blood vessels
      – Normal
      – neovascularization
    • Iris processes
    • Pigment
  – Angle recession
  – Peripheral anterior synechiae

• **Iris**
  – Congenital
    • Coloboma
    • Aniridia
      – Missing
    • Albinism

• **Iris**
  – Iris plateau
    • Iris configuration
  – Cysts
  – Nevi
  – Tumors
  – Neovascularization
  – Transillumination Defects
  – Atrophy
  – Dialysis
  – Iridectomy
  – Iridotomy
  – Pupil
    • Neuro-ophthalmology

• **Corneal endothelium**
  – Krukenberg’s spindle
  – Guttata

• **Anterior lens capsule**
  – Pseudoexfoliation
• Inflammation
  – Flare
    • Proteins
    • Glue

– Cells
  • WBCs
    – Slow upward movement
    – Film

Plasmoid aqueous

Hypopyon

Cells video
• **Posterior Synechiae**
  – Attachment of the pupillary margin of the iris to the anterior lens capsule
  – Evidence of past inflammation

• **RBCs**

**Hyphema**
• Anterior chamber IOL

• Persistent pupillary membrane (PPM)
• **Posterior Embryotoxon**
  – Prominent/anteriorly placed Schwalbe’s line
Anterior Chamber Angle

- Drains aqueous humor
  - Primarily done by the trabecular meshwork
Tissues Involved in Glaucoma

- Iris root
- Ciliary body
- Scleral spur
- Trabecular meshwork
  - Juxtacanalicular
  - Corneoscleral
  - Inner uveal
- Schwalbe’s line

Posterior TM = Filtering
Anterior TM = Non-filtering
Grading Systems

a) Schwalbe’s line
b) Trabecular meshwork
   – Schlemm's canal
c) Scleral spur
d) Ciliary body
e) Iris root

- Becker-Shaffer’s Method
  – Most posterior structure visible
The corneal wedge technique uses the slit lamp to create two visible lines that come together at Schwalbe’s line, making the line easy to identify if a patient has no trabecular pigmentation. (Painting by E. Lee Allen, copyright, the University of Iowa.)
How?

- Gonioscopy
  - Definitive technique for assessment
  - Indirect and direct visualization of the angle
    - BOTH visualize the [actual] structures of the angle
  - Permits detection of angle abnormalities
Lenses for Gonioscopy

• Goldmann
  – Three mirror
• Four mirror
  – Posner
  – Sussman
  – Flanged
Gonioscopy Views

Gonioscopy Video:
www.adelabdelsafik.com
Angle Assessment

• “Openness”
  – Which angle is typically the most open?
  – Which angle is typically the most pigmented?
Iris Insertion

Insertion just below scleral spur

Insertion well into ciliary body

Both of these have a flat iris (normal)
Iris Insertion

At first glance this angle appears closed (Iris insertion high into TM)

However, look at the configuration of the iris - bowed forward (convex)

With indentation gonioscopy, see that iris insertion is deep to CD
Iris Configuration

• All of these “Irides” insert at Ciliary Body
• Iris Bombe
  – Anteriorly bowed iris secondary to accumulation of fluid behind iris.
• Iris Bombe with indentation gonioscopy

• Iris plateau
  – Sharp turn posteriorly
Iris Plateau

deeper central anterior chamber but shallow in periphery; angle crowded by peripheral iris tissue
Double Hump Sign

Angle Closure in Younger Patients

Chang, et al. Trans Am Ophthalmol Soc. 2002;100:201-214. Of the 67 patients studied 35 (52%) had iris plateau syndrome
• Corneal Wedge

• Normal Vasculature
- Blood backed-up in SC

- Iris Cyst
• Iris Melanoma

4. A gonioscopic image of iris melanoma. Notice how the melanoma obscures the angle.
• Iris Processes

12. Observe the lacy appearance of the iris process.
• Sampaolesi's line

• Posterior Embryotoxin
• Peripheral Anterior Synechiae (PAS)
• Neovascularization
• Angle Recession
  Recessed Angle secondary to Trauma

• Pigment

Excessive pigmentation ALWAYS demands an explanation
Iris

- **Evaluation Tools**
  - Gross observation
  - Slit Lamp
  - Ultrasound
- **Part of Uveal track**
  - Pigmented
  - Vascular
- **Pupil**
• Aniridia

• Albinism
• Coloboma

• Configuration
  – gonioscopy

Iris plateau with iridoplasty

Iris Bombe
• Iridodialysis

• Iridodonesis
  – Movement of iris with eye movement

video
• Iris Transillumination Defects (TID)
  – Peripheral
  – Pupillary margin
- Benign tumors (nevi)
- Malignant tumors

Tigroid iris

Congenital
• Iridectomy
  – Surgical

• Iridotomy
  – LPI
• Pseudoexfoliation

• Neovascularization
  – Rubeosis
• Atrophy

• Pigmentation
• Heterochromia

• Nodules
  – Accumulation of WBC
• Melanoma

• Moth-eaten appearance
• Persistent Pupillary Membrane (PPM)