

**AMERICAN ACADEMY  
of OPTOMETRY**

**Gonioscopy and Identification of Normal  
and Abnormal Angle Structures**  
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Disclosure Statement  
 • Nothing to disclose


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## Angle structures

- Iris
  - Blood vessels in stromal layer with radial or circumferential orientation
  - Inserts into face of CB posterior to SS (rarely inserts into SS)
- Ciliary Body
  - Functions: aqueous production/regulation, accommodation, secretion of hyaluronate into vitreous, blood aqueous barrier
  - Circular muscle fibers (accommodation); Longitudinal muscle fibers (pulls open TM and Schlemm's canal)
  - Ciliary body face: portion that borders the anterior chamber; approx 10% of aqueous outflow is uveoscleral

## Angle structures

- Scleral Spur
  - Site of attachment for the longitudinal muscle of the CB (pulls on spur and opens TM)
  - Yellows with age
- Trabecular Meshwork
  - Aqueous flows through TM
    - Deepest layers most resistant to outflow
    - Anterior meshwork usually non-pigmented, posterior meshwork becomes more pigmented over time (more flow through posterior TM)
    - Most TM pigment is intracellular (ingested through phagocytosis)

## Angle structures

- Schlemm's Canal
  - Lies at the base of the scleral sulcus (not visible)
  - Drains into venous system
    - Can close under pressure
- Schwalbe's line
  - Transition zone between TM and corneal endothelium
  - Transition from scleral curvature to steeper corneal curvature
  - Flat in most eyes but can form a ridge (most often inferior)

## Normal Variants

- Iris processes
  - Uveal extensions from the iris to the TM
  - Usually insert close to SS but sometimes extend to Schwalbe's
  - Usually fine and extend into posterior TM – follow concavity of angle – do not inhibit iris movement
  - Can be broken in angle recession
- Sampaolesi's line
  - Settling of pigment on or anterior to Schwalbe's line
- Posterior Embryotoxin
  - Prominent anterior Schwalbe's line
  - Usually a normal variant, but can be associated with Axenfeld-Rieger Syndrome

## Normal Variants

- Blood in Schlemm's canal
  - Can occur if large diameter CL compresses episcleral veins or when IOP is low and episcleral pressure high
- Angle Vessels
  - Normally have radial orientation in iris and normal caliber (neovascularization would be fine and often crosses the scleral spur)
  - More visible in light irides

## Indications

- Visualize anterior chamber structures and depth
- Angle closure
- Angle recession
- Synechia
- Neovascularization
- Neoplasms
- Trauma

## Direct Gonioscopy

- Steep contact lens (Koeppel, Hoskins-Barkan, Swan-Jacobs) – light from angle exits eye nearly perpendicular to lens/air interface
- Surgical procedures, exams under sedation

## Indirect Gonioscopy

- Goldmann three-mirror lens
  - Fundus lens
  - Thumbnail (59 deg) for viewing angle and ora serrata
  - Rectangular (67 deg) for viewing equator to ora
  - Trapezoid (73 deg) for viewing post pole to equator
  - View angle opposite mirror
  - Coupling solution
- Four-mirror lenses
  - With and without handles
  - No coupling solution required
  - Four quadrants visible, 11 deg rotation to complete view

## Indirect Gonioscopy

- Indentation gonioscopy
  - Due to small area of contact with cornea, angle can be deepened with pressure
  - Distinguish between synechial and appositional closure
  - Difficult when IOP high
- One-mirror, two-mirror and laser lenses
  - Concentrate laser energy
  - Convex buttons to increase mag
  - Broader viewing area

## Procedure

- Lens preparation
  - Clean with mild cleaning solution (diluted dish detergent) and soft cloth
  - Sterilize with Glutaraldehyde 2% aqueous solution (soak 25 min) or Sodium Hypochlorite (household bleach) 10 parts water, 1 part bleach (25 minutes)
  - Alcohol, peroxide and acetone may damage lens surface
  - Coupling solution
    - Methylcellulose
    - Carboxymethylcellulose
    - Store upside down

## Procedure

- Patient Positioning (allow for enough vertical range with slit lamp)
- Check corneal integrity
- Anesthetic
- Microscope
  - Light source zero degrees (perpendicular to pupil)
  - Low/med mag
  - Parallelpiped (vert sup and inf views, horiz nasal and temp) – approx 4 mm width

## Procedure

- Application of lens
  - Hold with thumb and forefinger
  - Mirror positioning
    - Mirror is opposite of structure in view
  - Pull lower lid down with patient in up-gaze
    - Rest lens on lower lid margin
    - Tilt lens onto cornea as patient looks straight ahead
    - Support hand on forehead rest or cheek
  - Rotation of lens
    - Hold with three fingers of one hand

## Procedure

- View Angle
  - Beam perpendicular to base of mirror
  - Glare, bubbles
  - Descemet's folds = too much pressure
  - Rock lens and change fixation to view more ant or post structures
    - Slide lens in direction opposite of mirror being used to improve view

## Procedure

- Corneal wedge
  - Reflection from inner and outer cornea – beam illuminates interface between cornea and opaque sclera – intersect at Schwalbe's line (anterior border of TM)
  - Thin slit lamp beam – slightly offset

## Procedure

- Lens Removal
  - Break seal
    - Rock lens
    - Look nasal and press on temporal sclera through lid
    - Ask patient to squeeze lids shut
  - Irrigation of coupling solution
  - Check corneal integrity

## Grading Systems

- Shaffer System
  - Angle between iris and trabecular meshwork
    - 4 = 45-35°
    - 3 = 35-20°
    - 2 = 20°
    - 1 = ≤10°
    - Slit
    - 0 = closed

## Grading Systems

- Spaeth System
  - Level of iris contact to wall of angle
    - A = anterior to TM
    - B = behind Schwalbe's line (in area of TM)
    - C = posterior to scleral spur
    - D = deep into ciliary body face (visible band of anterior CB)
    - E = extremely deep (wide band of CB visible)
  - Width of angle
    - Angle made by line tangential to iris and line tangential to face of the TM
    - 0-40+°
  - Configuration of iris
    - s = steep or convex
    - r = regular or flat
    - q = queer or concave

## Grading Systems

- Scheie System
  - Angle structures visible
    - O = entire angle visible with wide ciliary body band
    - I = iris obscures part of ciliary body
    - II = nothing posterior to TM visible
    - III = posterior TM not visible
    - IV = no structures posterior to Schwalbe's line visible
  - Angle pigmentation
    - 0 (no pigmentation) to IV (heavy pigmentation)

## Laser Peripheral Iridotomy

- Indications
  - Acute angle closure glaucoma
  - Chronic angle closure glaucoma
  - Aphakic or pseudophakic pupillary block
- Prophylactic treatment
  - History of acute angle closure in fellow eye
  - Appositional closure with indentation gonioscopy
  - IOP increase and angle closure with dilation
  - Symptoms suggesting subacute angle-closure attacks
    - Transient blur
    - Halos
    - Ocular pain or frontal headache
  - Anxiety about spontaneous angle closure

## Management of Acute Angle Closure

- Topical Beta-blocker 0.5% and or Apraclonidine 0.1%
  - Check pressure q15-30 minutes
- Compression gonioscopy to temporarily open angle and force fluid into TM
- Prednisolone Acetate 1% (q15-30 min x 4 doses then hourly)
- Oral Acetazolamide 500mg (two 250mg tablets)
- Hyperosmotic agents: 3-5oz oral glycerin or isosorbide over ice
- Pilocarpine 1-2% only in cases of phakic pupillary block or angle crowding
  - Q15 minutes x 2 doses
  - Do not use in aphakic or pseudophakic pupillary block or mechanical closure of angle
- Maintain pressure with medical treatment as necessary and refer within 1-3 days
  - Topical Beta-blocker 0.5% bid
  - Acetazolamide 500mg sequel po bid
  - Prednisolone Acetate 1% q 1-6h
  - Pilo 1-2% qid (phakic pupil block or angle crowding)