

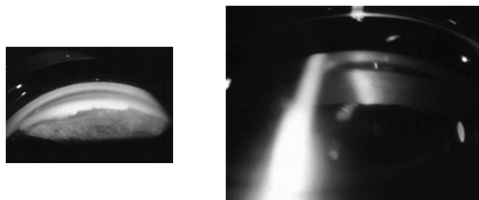
Understanding Angle Closure

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Case

- 56 year old Caucasian Male
- Primary Eye Exam
- BCVA:
 - 20/25 OD with +1.25 DS
 - 20/25 OS with +1.75 DS
- Slit Lamp Exam:
 - 2+ deep angles
 - 2+NS

Gonioscopy



- Can I dilate?
- Are the Angles Occludable?
- Should I refer?

Outline

- Define and Classify Angle Closure
 - Primary Angle Closure Suspect (PACS)
 - Primary Angle Closure (PAC)
 - Primary Angle Closure Glaucoma (PACG)
- Diagnostic Testing
- Treatment options
- Plateau Iris

- Angle closure accounts for 10% of all glaucoma in US¹.
- More prevalent worldwide
- 5.3 million people will be blinded by angle closure by 2020¹
- 90% of all angle closure in US will be due to pupillary block²
 - 10% non-pupillary block angle closure
- Increase in angle closure GLC due to aging population, increased optometric screening, and increased awareness of narrow angle among clinicians³

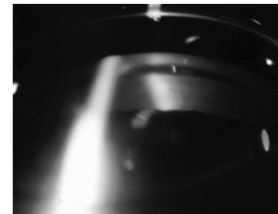
¹Quigley HA, et al. Br J Ophthalmol. 2006;90(3):262-267.
²Ritch R, et al. Ophthalmology. 2003;110:1880-1889.
³Morley AM et al. Br J Ophthalmol. 2006; 90(5):940-5.

Categories of Angle Closure

- Primary Angle Closure Suspect (PACS)
 - More than 2 quadrants of TM is not visible with static gonioscopy (<180° of visible TM on gonioscopy)
 - No PAS and Normal IOP
- Primary Angle Closure (PAC)
 - More than 2 quadrants of TM is not visible with static gonioscopy (<180° of TM visible)
 - PAS &/or increased IOP &/or acute angle closure attack
 - No glaucomatous optic atrophy
- Primary Angle Closure Glaucoma (PACG)
 - PAC with glaucomatous optic neuropathy

What is an Occludable Angle?

- An angle is considered "occludable" if at least 180° of the trabecular meshwork cannot be visualized with gonioscopy.
- If the TM is not visible, need to perform compression gonioscopy to determine if it is appositionally closed or closed from synechia.



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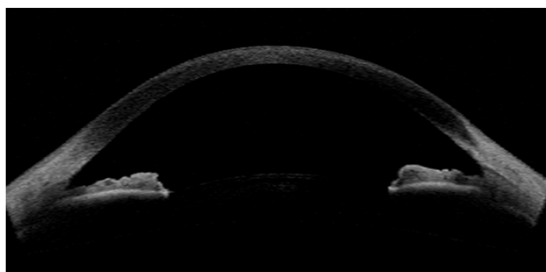
Diagnostic Tests to Evaluate the Angle

- 4 mirror gonioscopy vs 3 mirror gonioscopy
 - Need to perform dynamic gonioscopy through compression
 - 3 mirror very difficult to perform compression/indent
 - Some would argue that it cannot be done
 - What type of irido-trabecular contact?
 - Apposition vs synechial contact
 - +PAS in primary angle closure
 - - PAS in Primary angle closure suspect
 - Gonioscopy is subjective
 - Angle depth can change depending on amount of light

Diagnostic Tests to Evaluate the Angle

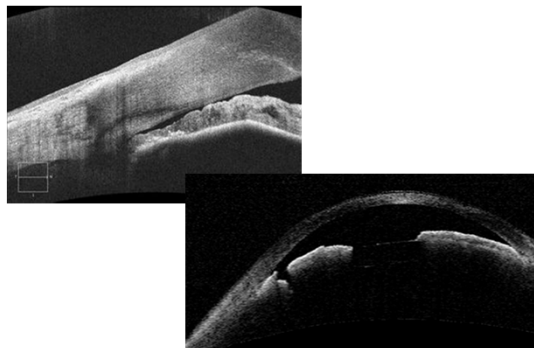
- Anterior Segment OCT
 - Provides static image of the angle
 - Depending on the model, can provide several data parameters
 - Angle opening distance
 - Trabecular iris space area
 - Trabecular iris circumference volume
 - Poor to differentiate the type of iridocorneal contact
 - apposition vs synechial
 - treat or not to treat

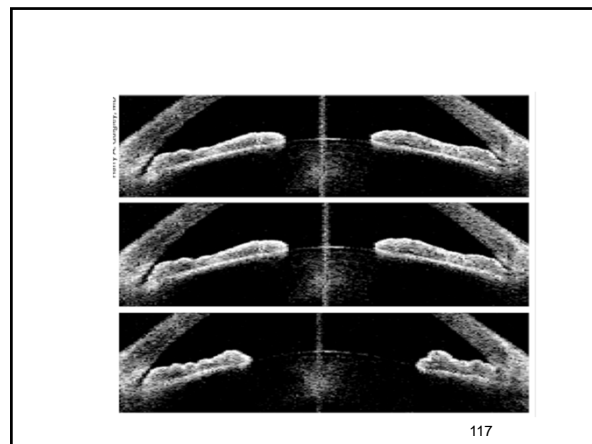
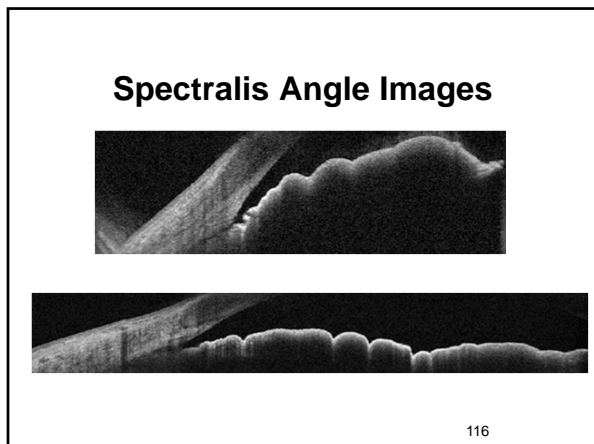
Normal Anterior Chamber Angle



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Anterior Segment OCT





Ophthalmic Technology Assessment

Evaluation of the Anterior Chamber Angle in Glaucoma

A Report by the American Academy of Ophthalmology

David J. Shah, MD, MPH,¹ Sanku Singh, MD, MPH,¹ Scott C. Lee, MD,¹ Philip C. Chen, MD,² Teresa C. Chen, MD,² Bruce A. Francis, MD,² Henry D. Jampel, MD, MS³

Objective: To assess the potential clinical utility of the anterior chamber angle imaging and gonioscopy and to determine whether such imaging aids in the diagnosis of primary angle closure PACS.

Methods: Literature searches of the English and Chinese literatures were last conducted on April 15, 2014. The authors reviewed 27 studies published between 1976 and 2014. The authors reviewed 27 studies published between 1976 and 2014. The authors reviewed 27 studies published between 1976 and 2014.

Conclusions: Although there is evidence suggesting that anterior segment imaging provides useful information in the evaluation of PAC, none of these imaging methods provides sufficient information about the ACA anatomy to be considered a substitute for gonioscopy. Longitudinal studies are needed to validate the diagnostic significance of the parameters measured by these instruments for prospectively identifying individuals at risk for PAC.

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Treatment Approach for PACS

- Who will develop acute angle closure?
 - Wilensky et al¹ enrolled 129 asymptomatic, occludable pts with anterior chamber depth <2mm.
 - After 5 year, 6.2% developed acute angle closure
 - 13.2% developed appositional closure or PAS
- Who will progress from PACS to PAC?
 - Thomas et al² followed 50 PACS patients.
 - After 5 years, 22% progressed to PAC.

¹Wilensky JT, et al. Am J Ophthalmol. 1993;115:338-346
²Thomas R, et al. Br J Ophthalmol. 2003;87:450-454

Treatment for PACS

- LPI vs observation
 - Consider LPI if increased risk:
 - Family history of angle closure, over 60 years old, female gender and hyperopia
 - If the angle is occludable
 - Less than 180° of TM with gonioscopy
 - If past symptoms of acute angle closure
 - Observation should include serial gonioscopy
 - Always PRIOR to any dilated exams
- Cataract extraction
 - Option for PACS who have a visually significant cataract

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Treatment of PAC and PACG

- If elevated IOP
 - medical management of elevated IOP first.
- LPI Goals
 - Relieve any pupillary block by equalizing pressure in anterior and posterior chambers.
 - Protect against progressive TM dysfunction and obstruction
- LPI should not be performed on eyes with more than 180° of PAS.
 - IOP spikes are risk due to not enough functioning TM to accommodate possible inflammation created by LPI

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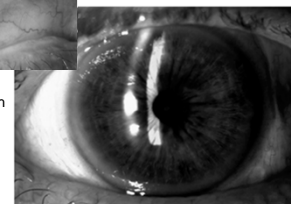
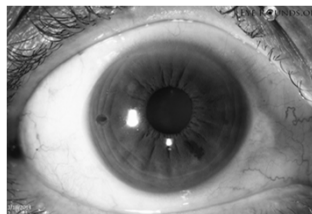
LPI Location: Temporal vs Superior

- New-onset linear dysphotopsia was reported in 18 (10.7%) eyes with superior LPI versus 4 (2.4%) eyes with temporal LPI (P = .002).
- Eleven eyes (6.5%) with superior LPI reported linear dysphotopsia despite complete eyelid coverage of the iridotomy.
- There was more pain experienced by the temporal LPI (2.8 ± 2.2 vs 2.1 ± 2.0 ; P = .001), despite no difference in laser energy or number of shots.

Vera et al. Am J Ophthalmology, 2014;157(5):929-935.

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LPI Location



- Dysphotopsia increased risk with Superior LPI
- Temporal placement becoming preferred to reduce risk

Vera et al. Am J Ophthalmology, 2014;157(5):929-935.

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Endoscopic Cyclophotocoagulation (ECP)

- IOP lowering due to ciliary body destruction
 - Reduced aqueous production
- Laser energy directed to the posterior portion of the ciliary process to cause shrinkage and concurrent retraction of the process and iris root posteriorly.
- Avoided if significant PAS due to the inflammation created
- May be more beneficial for plateau iris

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Iridoplasty

- Iridoplasty after LPI is controversial
 - One clinical study in China¹
 - one group received iridoplasty and other did not.
 - No difference in IOP, endothelial cell counts, or overall complication rates.
 - Ritch demonstrated improved angle architecture after iridoplasty²
 - Help break an acute attack
 - Relieve appositional closure secondary to plateau iris or lens related angle closure

¹Sun et al. Am J Ophthalmol. 2010;150(1):68-73.
²Ritch et al. Surv Ophthalmol. 2007;52(3):279-288.

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Cataract Extraction of PAC and PACG

- Many studies to date with *visually significant cataracts*
 - Cataract extraction deepens the anatomical angle
 - Prevents pupillary block
 - Reduces IOP
 - Reduced number of glaucoma medications
- Comparison of phaco alone vs combined phaco/trabeculectomy in both medically controlled and medically uncontrolled eyes
 - Phaco alone reduced IOP in both groups
 - IOP reduced by 8mmHg in the uncontrolled grp
 - Effect lasted more that 2 years

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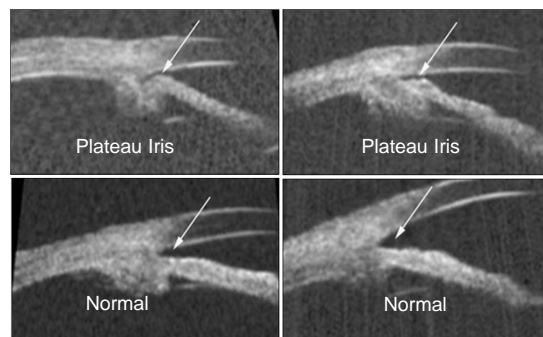
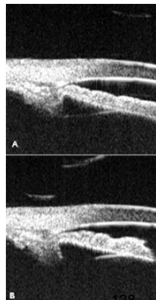
Effectiveness in Angle-closure Glaucoma of Lens Extraction (EAGLE) Study Group

- Multicenter randomized trial
- Newly diagnosed PACG or PAC with IOP >30 mmHg at diagnosis with no visually significant cataract
- Outcomes:
 - Quality of life and vision measures
 - IOP
 - Stability of disease
 - Safety of interventions
 - Cost per quality adjusted life year
 - 3 years of follow-up.

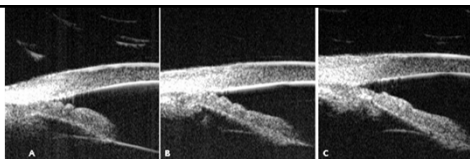
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Plateau Iris

- Plateau iris results from large or anteriorly positioned ciliary processes holding forward the peripheral iris and maintaining its apposition to the trabecular meshwork.
- Female, in their 30-50s, hyperopic, and often have a family history of angle-closure glaucoma.



Roberts DK, Ayyagari R, Moroi SE. Possible association between long anterior zonules and plateau iris configuration. J Glaucoma 2006;17:393-6.



- Plateau iris syndrome usually is recognized in the postoperative period when the angle remains persistently narrow in an eye after iridotomy.
- Patients may present with angle closure, either spontaneously or after pupillary dilation.
- More commonly, the diagnosis of plateau iris configuration is made on routine examination.

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- Can I dilate?
 - Properly classify PAGES, PAC, PACG
 - Synechial closure vs appositional closure
- Are the Angles Occludable?
 - Less than 180° of visible TM with gonioscopy
- Should I refer?