Centre for Eye Health

CHAIR-SIDE REFERENCE: GONIOSCOPY AND THE ANTERIOR CHAMBER ANGLE

Examination of the anterior chamber angle is a critical part of the eye examination, especially in glaucoma. Gonioscopy remains the gold standard technique for visualising the angle structures and for devising an appropriate management. This reference is designed to provide a guide to identifying the structures, but the clinician should practice this technique frequently to become expert at its deployment.

Gonioscopy

Before you begin

Commonly used lens types:

Lens type	Advantages	Disadvantages
Flanged[1] 	• Stable view, less affected by eyelids and blinking	• Cannot perform indentation • May be more challenging for small eyes
Non-flanged[2] 	• May be quicker for insertion and removal • Can perform indentation • Suitable for smaller eyes	• Less stable view • More eyelid interaction • Potential for inadvertent indentation

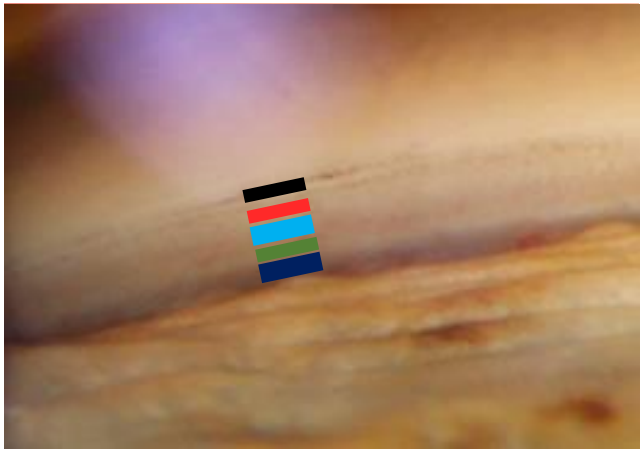
[1] Flange size may differ across lenses, and very small flanges (smaller than the corneal diameter) may allow some indentation. [2] Although some non-flanged lenses may advertise "no fluid", it is still recommended to use coupling fluid to reduce the chances of corneal staining. Patient preference may differ individually: some may prefer no flange as it is less confrontational, but flanged lenses may offer additional stability and reassurance.

Slit lamp and room set up

- Room illumination should be dim to minimise artificial angle opening
- Slit lamp rheostat should be at the lowest settings; neutral density filter can also be used
- Beam width and height should be minimised to reduce additional light entering the eye

Grading gonioscopy findings

Deepest visible angle structure



Structure	Description
Schwalbe's line (SL)	Fine, irregular shiny line (sometimes pigmented) at the termination of Descemet's membrane
Anterior trabecular meshwork (ATM)	Non-pigmented homogenous zone below Schwalbe's line
Posterior trabecular meshwork (PTM)	Slightly more mottled, variably pigmented (none to heavy)
Scleral spur (SS)	Homogenous, dense white and somewhat shiny band
Ciliary body (CB)	Dull pink, brown or grey band

There are numerous named grading systems in practice. However, to be unambiguous, we recommend the simplified system described above.

Trabecular pigmentation (blue arrow)

Amount of pigmentation

None 

Moderate 

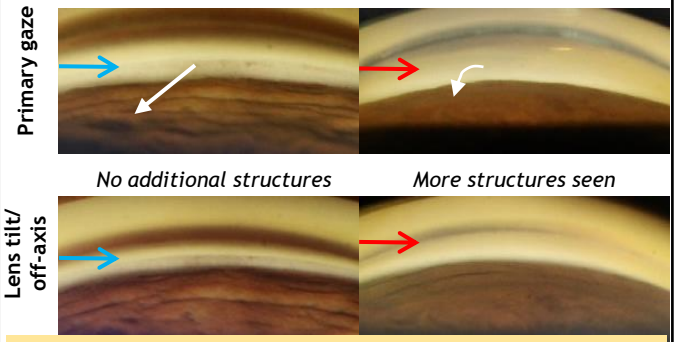
Heavy 

Distribution of pigment

Mottled (e.g. trauma, PXF) 

Homogenous (e.g. pigment dispersion) 

Iris contour



Primary gaze versus lens tilt: Changing the view of the angle provides an impression of the iris contour (is it flat or rounded/steep). More structures seen on tilt implies steep contour

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Imaging modalities for assessing the anterior chamber angle

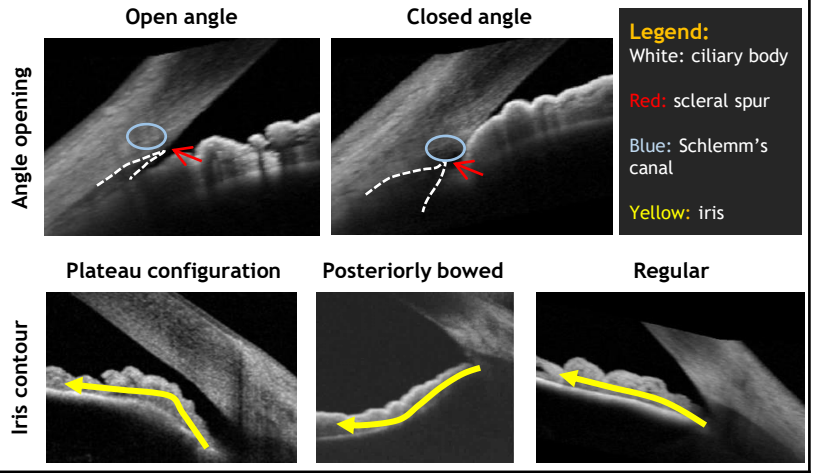
Optical coherence tomography

Key advantages

- Quick, non-invasive, high resolution
- Can be repurposed from posterior segment imaging devices
- Many quantitative parameters become available [note: no parameter cut-off exists for identifying angle closure]
- Can visualise iris contour, lens-iris interaction and lens vault
- Relatively well-controlled background lighting

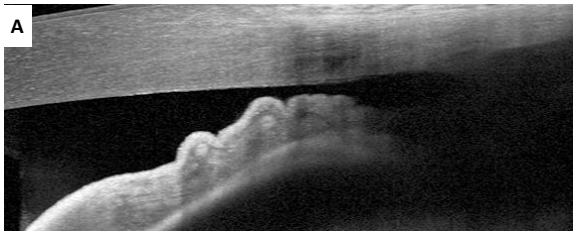
Key disadvantages

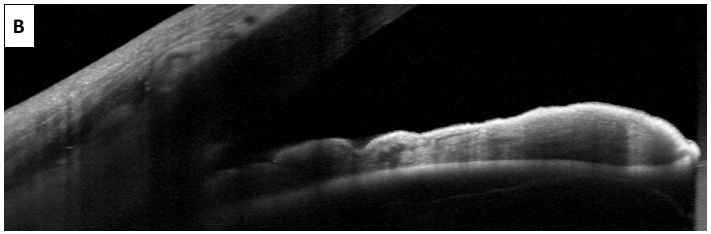
- Requires visualisation of key landmarks such as scleral spur, Schlemm's canal (not possible in around 20% of patients)
- Cannot visualise key anatomical structures in *en face* manner (e.g. trabecular meshwork)
- Most commercially available instruments only give one slice (not sufficient for describing entirety of the anterior chamber angle)
- Specialised (e.g. swept-source) devices more appropriate than repurposed posterior segment devices
- Affected by anterior segment pathologies (e.g. conjunctiva) and corneal compensation protocols required to adjust for image magnification – see examples below



Examples of challenges with anterior segment imaging

- The lateral angles are easier to image compared to superior/inferior angles, which are susceptible to distortions due to instrument-specific image scaling (A, example of superior angle imaging, where primary gaze imaging is not possible)
- Opacities on the conjunctiva and cornea can obscure the angle structures (B, example of pterygium)



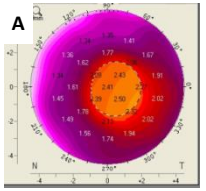


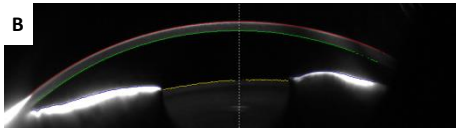
Scheimpflug imaging

Key features

- Allows quantification of anterior chamber parameters (A)
- Allows visualisation of the angle across the anterior chamber width
- Cannot visualise anterior chamber angle itself (B); few normative data available for quantitative information

Example images



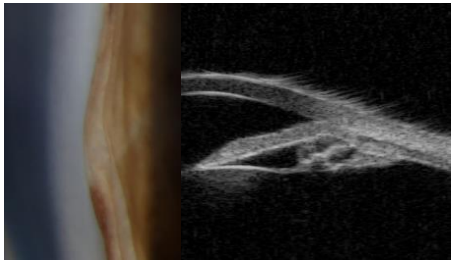


Ultrasound biomicroscopy

Key features

- Allows visualisation of the retroiridal space by penetrating the pigment epithelium (e.g. iridociliary cysts, ciliary body position and lesions)
- Resolution much lower than that of optical coherence tomography
- Requires contact with ocular surface

Example case



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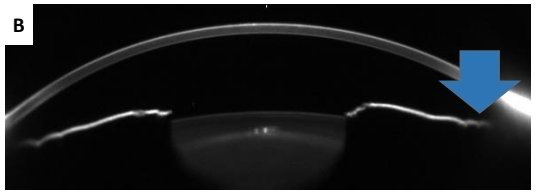
Other angle features and example photographs and imaging results

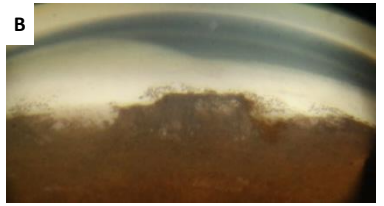
Angle recession

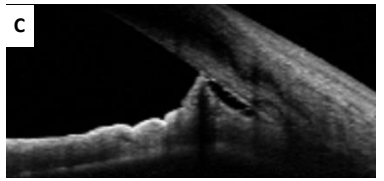
- Widened ciliary body band and increased trabecular pigmentation (A, yellow arrow)
- Posteriorly displaced iris profile (B, blue arrow)
- Need to check the amount of trabecular pigmentation



Peripheral anterior synechiae vs. iris processes

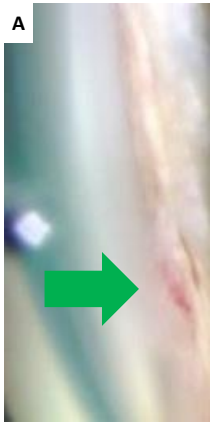
- Iris processes (normal) have a fine, wispy appearance typically do not extend beyond posterior trabecular meshwork (A, black arrows)
- Synechiae (pathological) can extend beyond the meshwork and have a "tapered" appearance (B). Do not shift on indentation because it is an iridocorneal adhesion (C)

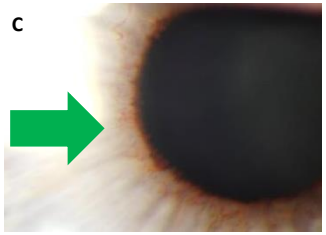




Neovascularisation vs. iris greater arterial circle

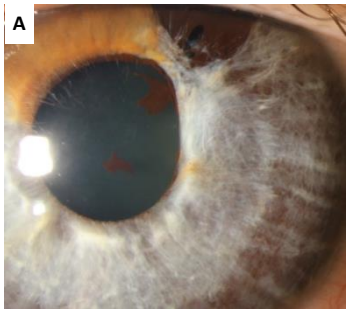
- Normal iris greater arterial circle may be more obvious or prominent in lighter coloured irises, appearing parallel to the iris contour (A)
- Neovascularisation at the angle (B) can occur in patients with cardiovascular disease. The vessels will appear perpendicular to the iris contour. Often seen with iris neovascularisation (C)

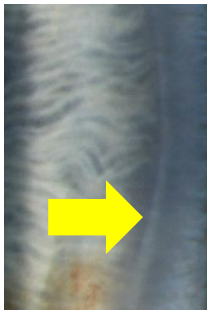


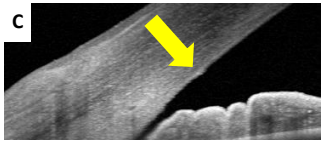


Posterior embryotoxon

- If no accompanying dysgenesis features are present (e.g. iris adhesions), then considered normal (8-30%); otherwise investigate for Axenfeld-Reiger syndrome (A) or Peter's anomaly
- Defined as the thickened, displacement of Schwalbe's line anterior to the limbus in the cornea (B)
- Appears as an opaque, prominent ridge (C)







Anterior chamber angle workflow

Set up gonioscopy lens and assess using **primary gaze**, **off-axis/lens tilt** and **indentation**

Record findings:
1. Deepest visible angle structure
2. Trabecular pigmentation/distribution
3. Iris contour
4. +/- other pertinent features

Angle closure disease staging

Primary angle closure suspect (PACS) definition:
- 2+ quadrants of PTM non-visibility on lens-tilt ***or*** iridotrabecular contact present

Primary angle closure (PAC) definition:
- PACS + either intraocular pressure >21 mmHg ***and/or*** synechiae present (1+ clock hours)

Primary angle closure glaucoma (PACG) definition:
- PACS ***or*** PAC present with glaucomatous optic nerve head ***or*** visual field defects
- Does **not** require elevated pressures, symptoms or synechiae to be present

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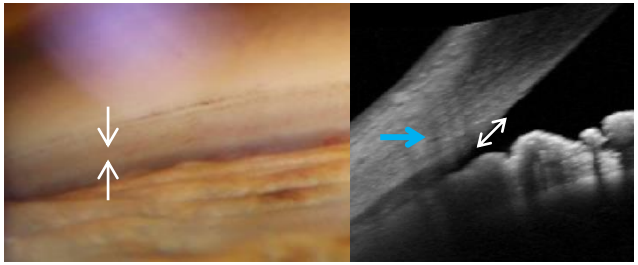
Supplementary information

Angle anatomy

- The key anatomical structure for angle closure is the trabecular meshwork
- The trabecular meshwork represents a “zone” (white arrow)
- The posterior trabecular meshwork is the key structure as it is the site of Schlemm’s canal (blue arrow)



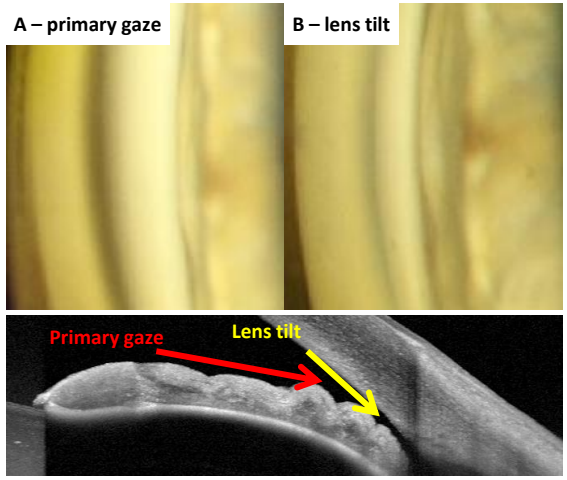
Relevance of angle closure to glaucoma

- Aqueous outflow is the primary driver of intraocular pressure (not aqueous production) and impairment of outflow is largely responsible for increased intraocular pressure and therefore potential for glaucomatous nerve damage
- Current topical therapies largely target either aqueous production or uveoscleral outflow. Some laser or surgical procedures (and future topical treatments) may target trabecular outflow

Gonioscopic techniques

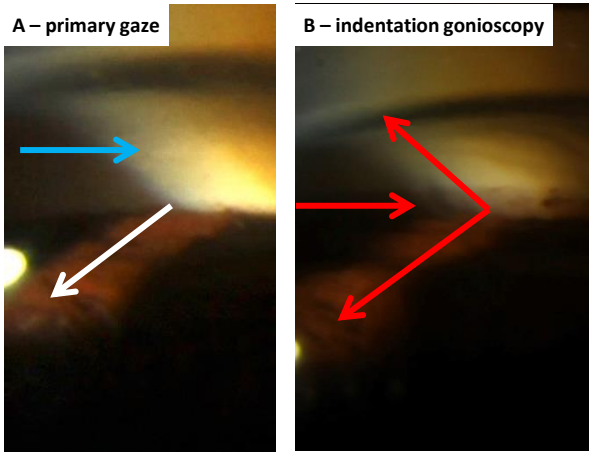
Primary gaze vs. lens tilt

- Procedure: ask patient to look in the direction of the mirror, or tilt lens in the same direction
- A small degree of lens tilt is typically recommended to see “over the hill” of the iris contour. This importantly allows the examiner to see iridotrabecular contact
- If no further structures (i.e. deeper than the trabecular meshwork) are seen on lens tilt, it is strongly suggestive of iridotrabecular contact



Corneal wedge

- Slitl lamp beam should be perpendicular to the mirror of regard (e.g. vertical beam for superior/inferior angles)
- Allows approximate quantification of angle width (in degrees) and visualisation of Schwalbe’s line (blue arrow) and iris contour (white arrow) (A)
- In indentation gonioscopy, allows an obvious dynamic view of angle widening (using structures visible *and* quantifiable angle width – see red arrows) (B)



Indentation gonioscopy

- Apply direct pressure to the eye using a non-flanged (or small diameter) contact goniolens until stress lines (below) appear (white arrows)
- Best performed with some, but not an excessive amount, of fluid to minimise corneal staining
- Angles that open up indicate no synechiael/adhesion related closure (blue arrow); if angles remain closed, suggests synechiae or attachments present