Anterior segment assessment for diagnosis of Glaucoma

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Making the Diagnosis

• Open angle
  – Primary/Chronic POAG/COAG (includes NTG, normal tension glaucoma)
  – Secondary open angle e.g. pseudoexfoliation, pigmentary glaucoma

• Closed angle/narrow angle
  – Acute/subacute/chronic CNAG
  – Secondary narrow angle
How to make diagnosis

- Full history for risk factors
- Visual acuity & pupil reactions (look for RAPD)
- Anterior segment examination for signs secondary glaucoma
- Intraocular pressure by Goldmann applanation
- Assessment anterior chamber depth and angle by gonioscopy
- Central corneal thickness CCT
- Visual field by standard automated perimetry
- Optic disc assessment, stereoscopic, dilated pupil
Differentiation open/narrow/closed angle

• Assess anterior chamber depth
  – Central : Redmond Smith at slit lamp or ultrasound measurement
  – Peripheral : Van Herick for peripheral AC, column at 60 deg illumination, thin slit beam

• Perform gonioscopy
  – Single mirror
  – Indentation
Assessment anterior chamber depth

• Van Herick for peripheral AC, column at 60 deg illumination, thin slit beam

• Van Herick grades
  – 1, AC less than 0.25 corneal thickness, closure possible
  – 2, AC 0.25 corneal thickness, closure possible
  – 3, 0.25 to 0.5 corneal thickness, closure unlikely
  – 4, 0.5 or more of corneal thickness, closure unlikely
Assessment anterior chamber depth

- Redmond Smith at slit lamp column and viewing at 60 deg
- Turn slit beam horizontally, enlarge from minimum until slit at cornea and at lens surface meet (focus needs to be in mid anterior chamber)
- Depth = slit beam size X 1.1 + 0.5
Shallow AC treated with PI

- Shallow AC PI post angle closure symptoms
Gonioscopy

• Necessary to make diagnosis
• To assess if angle open or narrow and pathological features
  – Clues to diagnosis
• Different classifications
  – Described by structures seen or by degrees open
Gonioscopy

Normal

Schwalbe line
trabecular meshwork
scleral spur
ciliary band

Angle closure

cornea
collecting channels
canal of Schlemm

tissue
Shaffer classification angle

- Used most commonly
  - 4 open, closure not possible, 40 deg, ciliary body band visible
  - 3 open, closure unlikely, 30 deg, scleral spur visible
  - 2 narrow, closure possible, 20 deg, trabecular meshwork visible
  - 1 narrow, closure possible, 10 deg, Schwalbe’s line visible
  - 0 closed, no structures visible
Other classifications

• Scheie’s classification
  • Described structures seen
  • Used roman numerals
  • I II III IV with IV closed
  • Now not used

• Spaeth’s classification
  • Looked at 3 features:
    • Level of iris insertion
      – A to E
    • Angular width expressed in degrees
    • Curvature peripheral iris
      – f for regular/flat
      – b for forward bowing
      – c for concave/back bowed
      – P for plateau
Features in angle

Wide open grade 4 trabecular meshwork highly pigmented ++++
Features in angle

Iris processes seen in angle across trabecular meshwork, differentiated from peripheral synechiae and congenital abnormalities

Angle recession following trauma, huge widening of angle where see ciliary body band
4 mirror/indentation gonioscopy

- Single mirror can give highly magnified views but
- Gonioscopy is a dynamic procedure
- 4 mirror used to indent and open angle to see if closure simply appositional or synechial
Indentation opens up peripheral angle
Classification Open Angle Glaucoma

- **Pretrabecular**
  - Fibrovascular membrane (rubeosis)
  - Endothelial layer: ICE, posterior polymorphous dystrophy
  - Epithelial downgrowth

- **Trabecular meshwork**
  - Idiopathic: POAG, steroid induced
  - Blockage/clogging meshwork
    - Red blood cells: (haemorrhagic, ghost cell)
    - Macrophages: (haemolytic, melanomalytic, phacolytic)
    - Neoplastic cells: (malignant tumour, neurofibromatosis, naevus of Ota)
    - Pigment particles: pigmentary, pseudoexfoliation
    - Protein: (uveitis, lens induced)
    - Viscoelastics
    - Vitreous
Rubeosis

Rubeosis iridis due to neovascular stimulus secondary to ischaemia of retina

Diabetic retinopathy
Central retinal vein occlusion
Epithelial downgrowth

- Post surgery/injury
- Corneal oedema
- Altered iris
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Phacolytic glaucoma

- Cataract
  - Mature
  - Hypermature
- Inflammatory signs
- Lens proteins leaking
- Differentiate from lens particle glaucoma
Pseudoexfoliation

Exfoliation material at pupil margin and on lens surface – often clear zone seen where pupil margin
Pigment in anterior chamber on iris/angle/cornea
Gonioscopy brown granular pigment: Sampaolesi’s line
Pseudoexfoliation

- Increased open angle and closed angle glaucoma
- Fragile zonules
- Watch for subtle changes and look dilated
Pigment Dispersion Syndrome

Krukenberg spindle
Iris rugae and pigment in these
Iris heterochromia possible

Heavy pigmentation angle on gonioscopy – black pigment
Scheie’s stripe at edge zonules
Pigment Dispersion Syndrome

May see mid peripheral iris bowing
Iris transillumination defects – spoke like can coalesce
Can cause sphincter atrophy
Uveitis

- Ciliary injection
- Flare
- Cells
- Keratic precipitates
- Posterior synechiae
- Iris transillumination
  (Herpes Zoster)
HSK uveitis
Herpes simplex keratitis

- Oedema/trabeculitis
Fuchs’ Heterochromic Cyclitis

- Iris heterochromia
- Stellate KPs without flare and cells
- Posterior subcapsular cataract
- Neovascularisation angle/iris
Fuchs’ Heterochromic cyclitis
Stills’ disease

- Chronic inflammation
- Cataract
- Band keratopathy
- White eye
- Pauci-articular juvenile arthritis
Glaucomatocyclitic crises

- Posner Schlossman syndrome
- High pressure
- Corneal oedema
- Mild inflammation
- Synechiae do not develop
- Overdiagnosed
  - Confused with uveitic and angle closure
Angle recession

- Mechanism not clear
- ?membrane like change from Descemet’s
- Higher incidence POAG in other eye
- 180 deg or more increases frequency
Post surgery – damage to angle

- Anterior chamber IOL
- Post keratoplasty
- Vitreous/aphakia
Classification Open Angle Glaucoma

- Altered meshwork
  - Oedema; (uveitis/scleritis/alkali burns)
  - Trauma: (angle recession)
  - Post-keratoplasty
  - IOFB: (haemosiderosis)

- Post-trabecular
  - Raised episcleral venous pressure
    - Sturge-Weber
    - Carotico-cavernous fistula
    - Cavernous sinus thrombosis
    - Retrobulbar tumours
    - Thyroid eye disease
    - Superior vena cava obstruction/mediastinal tumours

- Obstruction Schlemm’s canal
Raised Episcleral Venous pressure

- Sturge Weber
  - Facial cutaneous angioma : Naevus flammeus, port wine stain)
  - Meningeal haemangioma
  - Rarely bilateral
  - 33% glaucoma
    - 88% of choroidal haemangiomas
    - 60% congenital, 40% adult
Thyroid Eye disease

- Retrobulbar infiltration can cause raised IOP
- Raised IOP in specific direction of gaze usu inferior rectus
Classification Angle-Closure Mechanisms

• **Anterior (pulling)**
  – Contraction membrane
    • Neovascular/ICE/posterior polymorphous dystrophy

• **Posterior (pushing)**
  – With pupil block
    • Lens induced: (intumescent, subluxation)
    • Posterior synechiae
  – Without pupil block
    • Plateau iris
    • Aqueous misdirection/ciliary block
    • Lens induced
    • Post scleral buckling or retinal photocoagulation
    • Tumours/masses: (melanoma, retinoblastoma, ROP, PHPV)
Closed angle

- PAS on gonioscopy showing one open area angle
Corneal problems and closed angle

- ICE syndrome
- Posterior polymorphous dystrophy
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Pupillary block glaucoma

- Narrow angle
- Lens intumescence/subluxation
- Posterior synechiae
Iris bombe
Iris bombe
Post acute angle closure glaucoma

• Spiralling iris fibres and atrophy
  – Horizontally oval pupil or non-reactive
Post acute angle closure glaucoma

- Glaucomflecken
Post acute angle closure
Plateau Iris

- Without pupillary block
- Anterior segment OCT
- UBM
- Anteriorly positioned ciliary body
- Iris surface flat with root anteriorly rotated
- Can be iris and ciliary body cysts
Plateau Iris

• Deeper central than peripheral anterior chamber
• Shallow anterior chamber peripherally despite patent peripheral iridotomy
Tumours and secondary glaucoma

• Ciliary body melanoma
  localised angle closure/narrowing
• Melanomalytic glaucoma – release of pigment
• Direct invasion of angle
Developmental Anomalies

• High insertion anterior uvea
  – congenital glaucoma
  – Juvenile glaucoma
  – Assoc with other developmental anomalies

• Incomplete development trabecular meshwork/Schlemm’s canal
  – Axenfeld-Rieger syndrome
  – Peters’ anomaly

• Iridocorneal adhesions
  – Axenfeld-Rieger syndrome
  – Aniridia
Anterior segment dysgenesis/congenital defects

Posterior embryotoxon: Axenfeld’s (anterior displaced Schwalbe’) forme fruste 8-15% population
Axenfeld-Rieger’s

- Gonioscopy: tissue bridges across angle
- Iris atrophy, corectopia, ectropian uveae
- Systemic anomalies: teeth
Summary

• Important to look for other anterior segment signs to make diagnosis