



## Clinical Guideline for the treatment of

### ACUTE ANGLE-CLOSURE GLAUCOMA (AACG)

#### DESCRIPTION

AACG is a potentially blinding presentation, but when met with appropriate and expeditious management, it has potentially excellent visual outcomes. This guideline is to be used by staff of the ED under guidance of the Ophthalmology SHO/Registrar.

Acute elevation of intraocular pressure (IOP) as the result of a closed drainage angle.

#### RED FLAGS

- Irreversible vision loss can occur within hours and so assessment and management should be prioritised at triage.
- Discuss with a senior clinician if the diagnosis is in doubt.

#### HOW TO ASSESS

##### *HISTORY*

- Symptoms typically include acute and severe pain, blurred vision, haloes around lights, frontal headache, nausea, and vomiting. May describe a prior history of intermittent eye pain in dim light or when reading, indicating intermittent angle closure prior to AACG attack.
- Signs include diffuse conjunctival injection, poorly responsive or fixed, mid dilated pupil, closed angle in the involved eye, (often narrow angle in fellow eye if primary aetiology), acutely elevated IOP (often over 35 mmHg), microcystic corneal edema, hazy iris details, poor fundal view, AC cells and flare. Posterior synechiae, segmental iris atrophy and glaukomflecken, may indicate a previous attack.
- Differential diagnosis for acutely elevated IOP with an open angle on gonioscopy; Glaucomatocyclitic crisis (Posner–Schlossman syndrome), Anterior uveitis – particularly herpetic in origin, Retrobulbar haemorrhage / inflammation, orbital cellulitis, Carotid–cavernous fistula, Hyphema / Microhyphema, Pigment dispersion syndrome:
- Risk factors; Hyperopia, female gender, family history of AACG, older age, Asian ethnicity, use of dilating drops, recent commencement or dose increase of certain medications in susceptible individuals with narrow angles (e.g. SSRI's, SNRI's, over-the-counter decongestants, motion sickness medication, anticholinergic agents,

sulfonamides, topiramate, phenothiazines); these may cause classical unilateral AACG, but also (rarely) bilateral forward rotation of the ciliary body / peripheral uveal effusions (autorefractometry will show high myopic shift).

## **EXAMINATION & INVESTIGATIONS**

### Indentation / compression gonioscopy

- Essential to determine if the trabecular blockage is reversible and may itself break an acute attack.
- Gonioscopy should be performed on both eyes.
- Gonioscopy on affected eye may be difficult because of corneal oedema.
- If gonioscopy is not able to be performed, the Van Herick limbal chamber depth (LCD) can help estimate the depth of the angle as a % of the peripheral corneal thickness (PCT). Use a very narrow slit of light on the slit lamp, projected at the limbus at an angle of 60 degrees.

### Underlying mechanisms

- Most cases of angle-closure are primarily the result of pupil block (75%), (*Apposition of the lens and the posterior iris at the pupil leads to blockage of aqueous humour flow from the posterior chamber to the anterior chamber. This mechanism leads to increased posterior chamber pressure, forward movement of the peripheral iris, and subsequent obstruction of the trabecular meshwork (TM)*) and as such, iridotomy may be effective at controlling earlier stages of disease.
- However, pupil block and plateau iris mechanisms may co-exist, and hence, it is important to consider performing a laser iridotomy even if a non-pupil-block mechanism is suspected.
- These present with iridocorneal touch but a moderate central AC depth in comparison to retrolenticular mechanisms with have a uniformly and centrally shallow AC.
- Aetiology of Secondary Angle Closure
  - PAS pulling the angle closed: Causes include uveitis, inflammation, laser trabeculoplasty.
  - Neovascular or fibrovascular membrane pulling the angle closed.
  - Membrane obstructing the angle: Causes include endothelial membrane in iridocorneal endothelial syndrome (ICE) and posterior polymorphous corneal dystrophy (PPCD), and epithelial membrane in epithelial downgrowth (often follows penetrating and nonpenetrating trauma).
  - Lens-induced narrow angles: Iris-TM contact as a result of a large lens (phacomorphic), small lens with anterior prolapse (e.g., microspherophakia), small eye (nanophthalmos), or zonular loss/weakness (e.g., traumatic, advanced pseudoexfoliation, Marfan syndrome).
  - Aphakic or pseudophakic papillary block: Iris bombe configuration secondary to occlusion of the pupil by the anterior vitreous. May also occur with anterior chamber intraocular lenses.
  - Drug-induced angle closure: Usually after increase in dose or within first 2 weeks of starting medication. Usually bilateral angle-closure due to supraciliary effusion and ciliary body swelling with subsequent anterior rotation of the lens-iris diaphragm. Myopia is induced secondary to anterior displacement of ciliary body and lens and lenticular swelling.
  - Choroidal swelling: Following extensive retinal laser surgery, placement of a tight encircling scleral buckle, retinal vein occlusion, and others.

- Posterior segment tumour: Malignant melanoma, retinoblastoma, ciliary body tumours, and others. Choroidal Nevus and Malignant Melanoma of the Choroid.
- Aqueous misdirection syndrome.
- In posterior mechanisms a B-scan Ultrasound may be helpful.
- Posterior mechanisms are rare but important to recognize in acute presentations as, in contrast to pupil block and anterior non-pupil-block mechanisms (which respond well to treatment with pilocarpine in the initial stages), lenticular or retro-lenticular block are typically **aggravated by pilocarpine treatment**.
- **Cycloplegia** with Atropine 1% is the preferred initial medical treatments in these rare cases.

## TREATMENT

### Manage symptoms

- Consider analgesia (e.g. paracetamol 1g PO/IV) and an anti-emetic (e.g. Stemetil 12.5mg IM)

### Decrease aqueous humour production

#### *Systemic*

- Acetazolamide 500mg PO/IV (IV is the preferred route due to faster onset of action and subsequent reduction in pain and IOP) (Caution with existing renal impairment) (Please perform an urgent U&E at time of IV cannulation prior to administration of acetazolamide for baseline renal function as may need repeated dosing)

#### *Topical routes*

Consider giving these simultaneously after checking patient suitability (combination forms are acceptable);

- $\alpha$ -2 agonist (e.g. loperidine 1% q15 mins for first hour – caution if previous history of angina / CAD),
- B-Blocker (e.g. Timolol 0.5% stat - caution Asthma / COPD)
- Carbonic Anhydrase Inhibitors (e.g. dorzolamide 2% stat)
- Prostaglandin analogues (e.g., latanoprost 0.005% stat)

Mannitol or glycerine can be considered if the IOP is not reduced with IV acetazolamide, after consultation with the Registrar on call or Consultant, and relative contraindications have been considered. These have potentially serious side effects and thus are given after admission to hospital for close monitoring. These must be used with caution in patients with diabetes, heart or renal failure, or in the setting of dehydration or hypotension.

IOP should be checked approximately 1 hour after administration of topical and oral medications.

IOP should be assessed by Goldmann applanation tonometry where possible to increase accuracy.

### Reopen the angle

- Indentation gonioscopy (Critical for diagnosis and can be therapeutic)
- Consider Pilocarpine 2% when IOP reducing below 40mmHg (efficacy is reduced in ischemic iris sphincter / IOP>40mmHg)

### Reduce inflammation

- Topical steroids (e.g. g. Pred Forte q 15 mins for first hour)

### Laser Peripheral iridotomy (LPI)

- This should be performed as soon as possible. If the cornea is persistently cloudy attempt to use topical glycerine 10%.
- The aim of LPI is to alleviate pupil block.
- For YAG laser use an Abraham iridotomy Lens which employs a 66D magnifies button.
- One adequately sized (approx. 300 microns) full- thickness PI (with gush of fluid and pigment release seen) required.
- Aim for a peripheral iris crypt and then move deeper to iris stroma.
- Avoid the upper tear meniscus to reduce risk of dysphotopsia.
- If there is a bleed pressure on to the globe with the Capsulotomy lens is advised.
- If the PI is unable to be performed due to poor view, laser peripheral iridoplasty may be indicated.
- Laser settings vary based on iris pigmentation (more energy required for heavily pigmented iris – these may benefit from pre-treatment with Argon laser prior to YAG laser) but in general;
  - **Argon Laser**  
Spot size 400 µm, duration 0.2 sec, energy 200-300 mW
  - **YAG Laser**  
2-6Mj
  - **Thermal Laser Peripheral Iridoplasty (TLPI)**  
Argon laser - Spot size 400 µm, 0.3-0.6 seconds, 200-400mW, aiming beam at most peripherhal part of iris – aim for visible contraction of iris without bubble formation – total 24 shots in 360 degrees, leaving 2 shot diameters between shots and avoiding visible vessels.
- Strongly consider PI of fellow eye prior to discharge if at risk of acute angle closure. This may also be done as an outpatient, in which case consider pilocarpine 2% QDS to this eye on discharge.

### Cyclodiode Laser

- Cases refractory to treatment should be admitted and considered for Cyclodiode Laser.

*Paracentesis is not advised as this is both difficult and dangerous. It may be performed only when the above management has failed / contraindicated and cycloclodiode is unavailable. It should be performed by a senior clinician only.*

### DISCHARGE INSTRUCTIONS

- All cases should have admission or follow up discussed with the consultant on call.
- Advise patient to return if symptoms return prior to the review appointment

- Patients can only be discharged once the IOP is controlled.
- Discharge medications may vary between patients and may include:
  - g. pilocarpine 2% TDS
  - g. Pred Forte q2h while awake for three days then QDS 1 week
  - g. Pred Forte QDS in the fellow eye if a prophylactic PI was performed
  - Consider g Brimonidine +/- g. timolol twice a day