

## Glaucoma Management – When, Which, and How

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### Learning Objectives

1. Identify the salient principles in the diagnosis and management of glaucoma
2. Discuss the main factors in determining when to commence the treatment of a case of glaucoma
3. Consider the treatment options and be able to customise an individual regime for each patient

### Glaucoma

- A group of progressive optic neuropathies characterised by degeneration of retinal ganglion cells resulting in changes in the optic nerve head
- Still a leading cause of irreversible vision loss in Australia
- The major proven treatment is to lower intraocular pressure (IOP)
- The goal of treatment is to maintain the patient's visual function and related quality of life
- Therapy should be individualised to the patient's needs and preferences
- Recent developments in the therapeutic field have led to changes in treatment paradigms

### Classification

- Glaucoma is classified into two major subtypes – open-angle and closed-angle
- Both open-angle and closed-angle glaucoma can be either primary or secondary

- Primary glaucoma is where there is no identifiable cause
- Secondary glaucoma refers to any form of glaucoma where there is an identifiable cause of raised IOP

### Open-angle

- Primary open-angle glaucoma is the most common form
- Normal-tension glaucoma occurs with IOP consistently 21 mmHg or less and show field defects closer to fixation, more localised retinal nerve fibre layer defects, and increased tendency for disc haemorrhages
- Secondary open-angle glaucoma is most commonly pseudoexfoliative and is associated with higher IOP and greater risk of blindness

### Closed-angle

- Closed-angle can be classified as primary angle-closure suspect (PACS), primary angle-closure (PAC), or primary angle-closure glaucoma (PACG)

	TM < 180°	↑ IOP or PAS	GON
PACS	+	-	-
PAC	+	+	-
PACG	+	+	+

### Staging

- Glaucoma can be staged according to severity
- Early: Mild defect not within 10° of fixation (MD better than -6 dB)



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- Moderate: Moderate defect not within 10° of fixation (MD from -6 to -12 dB)
- Severe: Visual field defect within 10° of fixation (MD worse than -12 dB)

## Management principles

- Management aims to prevent visual disability during a patient's lifetime
- Where disability exists, the aim is to prevent further deterioration
- Glaucoma management is aimed at reducing IOP to stop or slow the rate of visual field deterioration while maintaining or enhancing quality of life

## Target IOP

- The upper limit of IOP that is estimated to be compatible with a rate of progression to maintain vision-related quality of life in the expected lifetime of the patient
- Should be individualised taking into consideration stage of disease, patient and ocular risk factors, life expectancy, social circumstances, and patient preferences

## Rate of progression

- Determining the rate of progression is a new standard in glaucoma care
- Perform 3 visual fields per year for the first 2 years to identify rapid progression
- Use rate of progression to continually re-evaluate target IOP and determine treatment intensity

## When to treat

- The rate of ganglion cell loss and resulting functional impairment varies significantly amongst different types of glaucoma and between individuals
- While lowering IOP slows or halts glaucoma progression, all interventions carry risk
- Potential benefit and possible harm need to be balanced carefully
- Patients should be involved in decision making

## Ocular hypertension

- Ten percent of patients with ocular hypertension will progress to primary open angle glaucoma within 5 years
- Risk factors for progression include elevated IOP, increased cup-to-disc ratio, older age, and thinner corneas
- Lowering IOP reduces the risk of conversion to glaucoma by 50%
- Patients at low risk of conversion should be considered for monitoring
- Patients at high risk of conversion should be considered for treatment

## Normal tension glaucoma

- Only 50% of patients with normal tension glaucoma show progression at 5 years
- Reducing IOP > 30% slows the rate of progression
- Risk factors for progression include female gender, history of migraine, and disc haemorrhage at diagnosis



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## Early primary open-angle glaucoma

- Without treatment, individuals with early POAG will convert more rapidly to advanced stages of disease with the inherent risks of visual field loss

## Advanced primary open-angle glaucoma

- Patients with advanced glaucoma diagnosis are at an increased risk of blindness
- Older age, lower education, male gender, and diabetes are significant risk factors for the progression of advanced glaucoma to blindness

## Primary angle-closure suspect

- Patients should have a discussion about whether to treat or not to reduce the risk of acute angle-closure or angle-closure glaucoma depending on their risk profile

## Primary angle-closure

- Treatment reduces the risk of primary angle-closure glaucoma and is recommended

## Primary angle-closure glaucoma

- Patients with angle-closure glaucoma are at increased risk of blindness
- Treatment is recommended

## **How to treat**

- Every patient is unique and treatment should be customised to the needs of the patient
- Use the best combination of laser, drops, and/or surgery to achieve the therapeutic IOP goal while minimising the impact on quality of life

## *Lasers*

### Selective laser trabeculoplasty (SLT)

- A low-energy laser directed at the trabecular meshwork
- Selectively targets melanin pigment which occurs in a proportion of cells in the trabecular meshwork
- Leaves non-pigmented cells unscathed
- Office-based procedure that increases aqueous outflow
- Used in primary open-angle glaucoma, pseudoexfoliation, pigment dispersion, and high-risk ocular hypertension
- Consider as first-line treatment or where IOP is not satisfactorily controlled (efficacy, tolerability, or adherence)

### Laser iridotomy (PI)

- Office-based procedure using a YAG laser to create a hole in the peripheral iris
- Used to treat or prevent angle-closure

### Laser iridoplasty

- Contraction burns are applied to the peripheral iris to pull it away from the trabecular meshwork
- Used to treat acute angle closure or plateau iris syndrome

### Laser cyclophotocoagulation

- Diode laser performed in theatre to destroy parts of the ciliary body and reduce aqueous production
- Used in painful blind eyes or where filtration surgery or tubes have failed, are likely to fail, or are not feasible



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## Medications

### Prostaglandins

- First-line glaucoma eye drop due to combination of effectiveness and tolerability
- Primary mechanism of action is to increase uveoscleral outflow
- Maximum IOP lowering achieved about 5 weeks from commencement of treatment
- Provide better IOP lowering and fewer side systemic side effects than beta-blockers
- Side effects include conjunctival hyperaemia, elongation of eyelashes, iris darkening, periocular skin pigmentation, prostaglandin orbitopathy (deep upper eyelid sulcus, upper lid ptosis, enophthalmos, and loss of orbital fat pads)

### Beta-blockers

- Second-line glaucoma medication
- Proven efficacy and known contraindications
- Indicated for once or twice daily dosing to reduce aqueous humour production
- Often used in fixed-combination medications
- Should be avoided in airways disease and may cause lack of energy and fatigue

### Alpha-agonists

- Decrease IOP by causing constriction of the ciliary vasculature leading to decreased aqueous humour production but also increase uveoscleral outflow
- Relatively safe however ocular allergy is common

### Carbonic anhydrase inhibitors

- Reduce aqueous humour production
- May cause burning, stinging, and a bitter taste
- Immune components of antibiotic sulphonamides are not present in CAIs and therefore they may be used with caution in patients with sulphur allergies
- Systemic CAIs are often poorly tolerated due to nausea, loss of appetite, lethargy, and tingling in hands and toes

### General tips

- Monotherapy is the first choice when initiating therapy for most patients
- Record baseline IOP to judge efficacy
- Avoid prescribing more than 2 bottles of glaucoma drops as this may lead to non-adherence
- Fixed-combination preparations are preferable to the use of separate agents
- Evaluate the ocular surface for signs of toxicity
- Consider preservative-free medications

### Surgery

#### Trabeculectomy

- Creates a guarded fistula into the sclera and allows egress of aqueous from the anterior chamber to the subconjunctival space
- Typically used where medical and/or laser options have failed



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## Glaucoma drainage devices

- Tubes used to drain aqueous from the anterior chamber to the subconjunctival space
- Indicated where trabeculectomy has failed or is likely to fail
- Consider in failed trabeculectomy, excessive conjunctival scarring from prior surgery, severe conjunctival disease, active neovascular glaucoma, and aphakia

## Minimally invasive glaucoma surgery

- Newer and less invasive surgical procedures which bypass the trabecular meshwork (iStent and Hydrus) or drain to the subconjunctival space (XEN)
- iStent and Hydrus are typically performed with cataract surgery in patients with mild-to-moderate disease, especially where eye drops are ineffective or poorly tolerated
- XEN can be performed standalone or in conjunction with cataract surgery in patients with glaucoma refractory to medical treatment



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