

**Types of Glaucoma**

- Open-angle: optic neuropathy characterized by visual field loss; usually associated with elevated IOP
  - Chronic, often asymptomatic
- Narrow-or closed-angle: closure of the angle between the iris and cornea, obstructing the outflow of aqueous humor
  - Painful red eye, can lead to permanent blindness w/in 24 h

**Goals of therapy:**

- Preserve visual function by slowing or halting progression of disease
  - Lower IOP (only clinically established method of treating glaucoma)
  - Preserve structure & function of optic nerve
- Maintain or enhance health-related quality of life
  - Minimize side effects of treatment and its impact on patient's vision and general health

**Initial treatment**

- Early or moderate open-angle glaucoma
  - Prostaglandin analogue (most efficacious, well-tolerated, once daily)
  - Alternatives:  $\beta$  blockers,  $\alpha$  agonists
- Advances open-angle glaucoma: laser or surgery with prostaglandin analogue in interim

**Preservatives, contact lenses**

- Preservatives
  - Benzalkonium chloride: most common; 6% allergic
  - Travoprost: ionic buffer preservative
  - Brimonidine: purite preservative
  - Some single dose, preservative-free forms
- Need to wait at least 15 min after drops with BAK before contacts lens insertion

**Monitoring**

- Efficacy:
  - IOP/visual field/optic nerve head
    - Early: every 12 months
    - Moderate: every 6 months
    - Severe: every 4 months
  - Adherence (education of pts)
    - Minimize # of medications
- Safety: adverse effects; disease-drug interactions

**Aqueous outflow:**

- Conventional pathway: trabecular
- Overflow pathway: uveoscleral

**Who to treat:**

- Glaucoma (elevated or normal IOP)
- Ocular hypertension (IOP > 21 mmHg) & high risk of progression
  - Higher baseline IOP, clinical findings, increasing age, African descent, family history, Type 2 diabetes mellitus

**Target IOP**

- Pressure likely to stop further damage to optic nerve
- Not fixed and should be regularly re-evaluated
- Depends on pre-treatment IOP, degree of optic nerve damage, visual field loss, age, other factors

**Intensification of therapy:**

- Combination of topical medications
- Laser therapy: trabeculoplasty (increases AH outflow)
- Surgery: alternative route for outflow
  - Possible scar tissue formation
  - Mechanical shunts also used

**Alternative interventions:** not been shown to alter outcomes

- Aerobic exercises can lower IOP modestly
- Canadian Ophthalmological Society does not support the use of marijuana for treatment of glaucoma (short duration of action & undesirable psychotropic and other systemic side effects)

**Proper eye drop technique**

- Shake well (roll in hands for 30 secs)
- Wash hands
- One drop or  $\frac{1}{4}$  -  $\frac{1}{2}$  inch ointment strip inside lower eyelid
- Close eyes for 1 min (up to 5) or punctal occlusion
- 5 min b/w drops, 10 min before oint
- Order: solution first, then susp/gel then ointment

**Medications to avoid**

**Open angle:** corticosteroids (all formulations)

- Reduced outflow of AH
- Alternative to ophthalmic CST is NSAID
- Use lowest potency for shortest time
- Monitor IOP with use > 10 days

**Narrow-angle:**

- Anticholinergic effects can cause dilation of pupil (blocks movement of AH)
  - Antidepressants; 1<sup>st</sup> gen antihistamines; antispasmodics; cyclobenzaprine; decongestants; H2 blockers; inhaled anticholinergics
- Lens swelling due to allergic reaction (sulfonamides)
- Increased risk: female, far-sighted, family history, age

**PG > Beta blockers > alpha agonists > B1 blocker**

**Topical medications**

Med class	MOA	Ex	SEs	Contraindications
Prostaglandin analogues  OD  ↓IOP 25-33%	Increased uveoscleral outflow	Bimatoprost (also increase trabecular outflow)  Latanprost Travoprost	<ul style="list-style-type: none"> <li>• Iris darkens</li> <li>• Conjunctival hyperemia</li> <li>• Burning, stinging, foreign-body sensation</li> <li>• Eyelash change (reversible)</li> <li>• Migraine</li> <li>• Flu-like sx</li> </ul>	<ul style="list-style-type: none"> <li>• Macular edema</li> <li>• History of herpetic keratitis</li> <li>• Active uveitis</li> <li>• Pregnancy</li> </ul>
Beta antagonists  OD – BID  ↓IOP 20-25%	Inhibit formation of aqueous humor	Selective B1: betaxolol  Non-selective: timolol; levobunolol	<ul style="list-style-type: none"> <li>• Allergic conjunctivitis</li> <li>• Bronchospasm</li> <li>• Bradycardia</li> <li>• Hypotension</li> <li>• Mask sx of hypoglycemia</li> </ul> <p>NASOLACRIMAL OCCLUSION reduces SEs by 50%</p>	<ul style="list-style-type: none"> <li>• Asthma</li> <li>• Sinus bradycardia</li> <li>• Heart block/ failure</li> <li>• Hypotension</li> <li>• Depression</li> <li>• Caution in preg</li> <li>• Timolol in lactation</li> </ul>
Alpha-2 agonists  BID – TID  ↓IOP 20-25%	Decreased production & increased outflow (brimonidine does both)	Aproclonidine Brimonidine	<ul style="list-style-type: none"> <li>• Allergic conjunctivitis</li> <li>• Dry mouth &amp; nose</li> <li>• Hypotension</li> <li>• Headache</li> <li>• Fatigue</li> </ul>	<ul style="list-style-type: none"> <li>• With MAOIs</li> <li>• Caution in pregnancy</li> </ul>
Para-sympatho-mimetics (cholinergics)  TID – QID ↓IOP 20-25%	Increased AH outflow (stimulate M receptors)	Pilocarpine	<ul style="list-style-type: none"> <li>• Bronchospasm</li> <li>• Brow ache</li> <li>• Intestinal cramps</li> <li>• Miosis</li> <li>• Myopia w/ spasm</li> <li>• Retinal detachment</li> </ul>	<ul style="list-style-type: none"> <li>• Neovascular, uveitic or malignant glaucoma</li> <li>• Caution in pregnancy</li> </ul>
Carbonic anhydrase inhibitors  BID – TID  ↓IOP 15-20%	Inhibit enzyme involved in formation of AH → reduce production	Brinzolamide Dorzolamide	<ul style="list-style-type: none"> <li>• Allergic dermatitis/conjunctivitis</li> <li>• Burning</li> <li>• Corneal edema</li> <li>• Metallic taste</li> </ul>	<ul style="list-style-type: none"> <li>• Kidney stones</li> <li>• Aplastic anemia</li> <li>• Sickle cell anemia</li> <li>• Thrombocytopenia</li> <li>• Sulfa allergy</li> <li>• Oral agents associated w/ teratogenicity</li> </ul>