

Overview of Glaucoma Therapies

0.25 CREDIT HOURS



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PHARMACIST OBJECTIVES

1. Differentiate between various treatment options for glaucoma

PHARMACY TECHNICIAN OBJECTIVES

1. Differentiate between various treatment options for glaucoma

OVERVIEW

Micro-learning opportunities were created in response to evidence that learning is maximized when delivered in short and focused 'bursts.' In this session, an overview of glaucoma therapies is provided along with general information describing each class of medication.

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TARGET AUDIENCE

Pharmacist, Pharmacy Technician

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When I am explaining glaucoma drugs to my student pharmacists or student Pas, I use the analogy of a bathtub filling up with water and a washcloth plugging the drain. As the tub is about to overflow, what corrective action would you take?

Step one is to shut the water off; step two is to unplug the drain. These two simple steps sum up how we treat glaucoma. We can shut the water off (decrease formation of the aqueous humor) or we can unclog the drain (facilitate drainage through the canal of Schlemm).

Glaucoma Medications That Decrease Production of Aqueous Humor

Beta-adrenoreceptor agonists (yellow or blue caps)

Mechanism:

- Decrease production of aqueous humor by the ciliary body without producing substantial effects on aqueous humor outflow
- Beta activity decreases during the night, so these drugs might not be effective while patients are asleep
- **NO EFFECT** on pupil size or accommodation

Indications for use:

- Open angle glaucoma
- May be used alone, or in combination with mitotics

Warnings/precautions/adverse effects:

- Stinging upon application
- Dry eyes
- **Only betaxolol is beta selective:** caution if using other beta blockers in cardio and pulmonary (specifically asthma) patients
 - May cause increased risk for bronchospasm, or bradycardia
- Caution in patients with decreased cardiac function
- Other side effects: depression, lethargy, dizziness, vertigo headaches, etc.
- If combining therapy with epinephrine: administer epinephrine 4 hours after using beta blocker

Drug interactions:

- Oral beta blockers: may potentiate systemic effect of decreased heart rate
- Digoxin and non-dihydro calcium channel blockers: may prolong atrioventricular conduction time and increase risk of hypotension or bradycardia

Patient education:

- Bradycardia and bronchospasm are common signs of overdose
- Do not touch dropper directly to the eye

Representative products:

- **Betaxolol (Betoptic®-S) 0.25% suspension**
 - Dose: 1 drop twice daily
 - **Beta-1 selective:** affects cardiovascular parameters
- **Timolol (Timoptic®-XE) 0.25% and 0.5% gel forming solution**
 - Dose: 1 drop once daily
- **Timolol (Timoptic®) 0.25% and 0.5% solution**
 - Dose: 1 drop twice daily
 - Timolol is non-selective: affects cardio and pulmonary parameters
- **Levobunolol (Betagan®) 0.25% and 0.5% solution**
 - Dose: 1 to 2 drops once daily; may increase to 1 drop twice daily
 - Levobunolol is non-selective: affects cardio and pulmonary parameters
- **Carteolol (Ocupress®) 1% solution**
 - 1 drop twice daily
 - Carteolol is non-selective: affects cardio and pulmonary parameters

Alpha-adrenoreceptor agonists (sympathomimetics) [purple caps]

Mechanism:

- The alpha agonists: brimonidine, dipivefrin, and epinephrine decrease formation of aqueous humor AND increase outflow of aqueous humor
- Apraclonidine (Iopidine): decreases aqueous production with NO effect on outflow

Indications for use:

- Apraclonidine, brimonidine, dipivefrin and epinephrine:
 - Open-angle glaucoma

Warnings/precautions/adverse effects:

- Minimal effects on blood pressure
- Caution with severe cardiovascular disease
- Caution in depression and Raynaud's phenomenon
- May cause fatigue/drowsiness in some patients

Patient Education:

- May cause fatigue or drowsiness

Representative products:

- **Brimonidine 0.15% (Alphagan-P®) solution**
 - CAUTION: new additional strength 0.1% (brand only)
 - Dosage: 1 drop three times daily (preferably Q8H)
 - **Brimonidine 0.025% (Lumify®)** is OTC for correction of red eyes, *not* glaucoma

Carbonic anhydrase inhibitors (orange caps)

Mechanism:

- Inhibits carbonic anhydrase (CA) in the ciliary process of the eye, reducing the production of bicarbonate ions leading to a decrease in aqueous humor production

Indications for use:

- Reduction of intraocular pressure in patients with open-angle glaucoma

Warnings/precautions/adverse effects:

- Sulfonamide derivatives that are absorbed systemically may cause allergic reaction. Caution for hypersensitivity reactions or Stevens-Johnson syndrome (SJS)-like reactions.
- Temporary blurring of vision: use caution while driving

Patient education:

- These are sulfa drugs. Watch for signs of allergy!
- Horrible taste can be mediated by using punctal occlusion (blockage of tear duct)
- Pinch bridge of nose for 30 seconds after administration

Representative Products:

- **Dorzolamide (Trusopt®) 2% solution**
 - Dosage: 1 drop three times daily
- **Brinzolamide (Azopt®) 1% suspension**
 - Dosage: 1 drop three times daily
- **Acetazolamide (Diamox®) oral**
 - Dose: 250 to 1000 mg daily
 - Available as 250 mg tablets or 500 mg SR capsules
 - Very useful as adjunct therapy
 - Watch for hypokalemia: consider supplementation with K+

Although we rarely dispense pilocarpine, it reminds me of my grandfather. As a little kid growing up, my grandpa lived only one block away, and I spent a lot of time at his house. He was a blacksmith, tall and thin and had the most gorgeous blue eyes, none of these characteristics he shared with me!

As he got older, he struggled more with his eyesight. He used pilocarpine eye drops several times a day to manage his glaucoma. Grandpa would sit on the front porch to read his large edition of the *Reader's Digest* or the newspaper. He always said the hardest part of growing was twofold, the loss of his friends and his eyesight. At age 77 he gave up his driver's license and sold his 1952 Chevy truck.

One day he was telling me that he was sitting by the window watching the birds at his bird feeder. He described a bright red cardinal, taking a sunflower seed in his beak and breaking it open and eating the kernel inside. What amazed me is how this guy who complained of failing eyesight could see such detail with such clarity.

As a pharmacist, it all makes sense. Grandpa had pinpoint pupils from the pilocarpine drops that made him struggle to see if there was not sufficient light. As long it was a bright and sunny day, grandpa could see such minor details as the birds eating at his feeder.

Glaucoma Medications that Facilitate Drainage of Aqueous Humor

Miotics (green caps) Pilocarpine

Mechanism:

- Parasympathomimetic drug which duplicates the muscarinic effects of acetylcholine
- Produces pupillary constriction, stimulates ciliary muscles, increases aqueous humor outflow
- It causes increased tension on the scleral spur and opening of the trabecular meshwork spaces to facilitate outflow of aqueous humor

Indications for use:

- Decrease intraocular pressure due to glaucoma
 - May be combined with beta blockers, carbonic anhydrase inhibitors, sympathomimetics, or hyperosmotic agents
 - May be acceptable alternative for patients that cannot tolerate cardiovascular side effects of beta blockers

Warnings/precautions/adverse effects:

- Miotics can induce vision changes or myopia (near-sightedness) in younger patients
- Miotics causes pupillary constriction that compromises vision in patients especially with cataracts
- Stinging and burning on application
- Decreased visual acuity
- Headache

- Decreased night vision

Patient education:

- Caution driving at night; vision may be affected

Representative products:

- **Pilocarpine (Vuity®) 0.25%, 0.5%, 1%, 2%, 3%, 4%, 5%, 6%, 8%, 10% solution**
 - Dosage: 1 drop up to four times daily; initiate on 1% and increase strength and dose based on intraocular pressure
- **Pilocarpine hydrochloride (Pilopine HS®) 4% ophthalmic gel**
 - Apply ½ inch ribbon in conjunctival sac once daily at bedtime (HS)
- **Pilocarpine (Ocusert Pilo) intraocular system**
 - Ocular system placed in eye
 - Changed weekly
 - Releases 20 mcg/hr for 1 week

Prostanoids (turquoise caps)

- Considered first-line by most ophthalmologists

Mechanism:

- Reduces intraocular pressure by increasing outflow of aqueous humor

Indications for use:

- Open angle glaucoma

Warnings/precautions/adverse effects:

- May discolor iris blue eyes to brown
 - Color change may be permanent
- Increases length, thickness, and pigmentation of eyelashes
- Eyelid skin darkening

Patient education:

- Color changes to iris
- Eyelash and eyelid changes

Representative products:

- **Latanoprost (Xalatan®) 0.005% solution**
 - Dosage: 1 drop once daily in the evening
 - Keep at room temperature for up to 6 weeks; keep refrigerated in the pharmacy before dispensing

- **Travoprost (Travatan-Z®) 0.004% solution**
 - Dosage: 1 drop once daily in the evening
- **Bimatoprost (Lumigan®) 0.01% solution**
 - Dosage: 1 drop once daily in the evening
- **Tafluprost (Zioptan®) solution**
 - Dosage: 1 drop once daily in the evening
 - Preservative free
 - Available in single use containers
- **Bimatoprost (Latisse®)**
 - The first drug approved for increasing eyelash growth
 - Patients using these prostaglandin eye drops noticed thicker and longer eyelashes
 - Takes about 8 weeks to work
 - Eyelashes return to "normal" a few weeks or months after stopping treatment
 - Darkens the iris and skin around the eyes
 - The skin darkening may be reversible while the iris darkening usually is not
 - Wait 15 minutes before re-inserting contact lens
- **Latanoprostene bunod (Vyzulta®) 0.024% solution**
 - Metabolized into latanoprost and nitric oxide increasing fluid outflow by two pathways
 - Not much more effective than latanoprost
 - Cost is \$180 for 2.5ml vs \$12 for latanoprost 2.5ml

Rho kinase inhibitors (white caps)

Mechanism:

- Rho kinase inhibitors increase fluid outflow through the trabecular meshwork
- Considered to be an add on to therapy, as it modestly decreases IOP

Indication for use:

- Reduction of elevated intraocular pressure in patients with open-angle glaucoma

Warnings/precautions/adverse effects:

- The most common side effects are conjunctival (eye) redness, golden brown deposits in the cornea (covering of the colored portion of the eye), pain with drug application, conjunctival (eye) bleeding, blurred or decreased vision, increased tearing and redness of the eyelid

Patient education:

- Remove contacts before administration and wait 15 minutes before reinserting

Representative products:

- **Netarsudil (Rhopressa®) 0.02% solution**
 - Dose: 1 drop once daily in the evening
 - Rhopressa modestly lowers intraocular pressure
 - Expensive product at \$230.00 per 2.5ml bottle
 - Refrigerate until opening then may be stored at room temperature up to 6 weeks
- **Netarsudil 0.2% combined with latanoprost 0.005% (Rocklatan®) solution**
 - Dose: 1 drop once daily in the evening
 - MAX dose: 1 drop daily

Color Codes for Topical Ocular Medications

Class	Color	Examples
Anti-infectives	Tan	Moxifloxacin, ofloxacin
Anti-inflammatories/steroids	Pink	Prednisolone
Mydriatics and cycloplegics	Red	Atropine, tropicamide
Nonsteroidal anti-inflammatories	Gray	Bromfenac, ketorlac
Miotics	Dark Green	Pilocarpine
Beta-blockers	Yellow	Timolol
Beta-blocker combinations	Dark Blue	Brimonidine and timolol
Adrenergic agonists	Purple	Brimonidine
Carbonic anhydrase inhibitors	Orange	Dorzolamide, brinzolamide
Prostaglandin analogues	Turquoise	Latanoprost, travoprost

--Have a great day on the bench!!

Activity Test

Overview of Glaucoma Therapies

Activity tests must be completed online at www.freeCE.com.

A passing grade of 70 or higher and completion of an online activity evaluation are required to earn credit.

- 1. A patient enters your pharmacy seeking to refill her glaucoma medication but cannot remember the name of the medication. She does remember it having a turquoise-blue colored cap. Which medication is she most likely describing?**
 - A. Timolol
 - B. Latanoprost
 - C. Pilocarpine
 - D. Brimonidine
 - E. Dorzolomide

- 2. Which class of glaucoma medications is utilized to DECREASE aqueous humor production?**
 - A. Rho kinase inhibitors
 - B. Prostaglandins
 - C. Carbonic anhydrase inhibitors
 - D. All of the above
 - E. None of the above