Drugs Used in Ophthalmology

Your plans may fail but you would never...!!!
Drugs Used in Ophthalmology

Glaucoma Medications

The glaucoma is treated by a single drug or a combination of two or more drugs, depending upon the level of intraocular pressure. The glaucoma medications are divided into 6 classes, most of which are used against chronic cases and one (Hyperosmotic agents) are used for emergency cases. The main classes of glaucoma medications are,

1. β – Blockers
2. Parasympathomimetics
3. Carbonic anhydrase inhibitors
4. Alpha agonists
5. Prostaglandin analogs
6. Hyperosmotic agents

1. β – Blockers

β – Blockers are recommended as first drug of choice. They act by decreasing the production of aqueous humor and hence, decrease the intraocular pressure. β – Blockers decrease the aqueous humor production either by decreasing the synthesis or the action on the adenyl cyclase of the non-pigmented epithelium of the ciliary body.

- Betaxolol is beta 1 selective.
- Timolol and levubunolol are non-selective.
Side effect

- Impotence
- Bronchospasm
- Heart block
- Depression
- Bradycardia
- Corneal anesthesia
- Fatigue

2. Parasympathomimetics

Parasympathomimetics are potent antiglaucoma drugs but recently they are not being preferred as the drug of choice in the glaucoma treatment because of their side effects such as miosis and spasm of accommodation etc. Presently, they are used as an adjunctive therapy.

- Pilocarpine (1%, 2% and 4% is available)
- Carbachol
- Phospholine iodide

Side effects

- Miosis
Spasm of accommodation
Headache
Diminished night vision
Iris cyst
Myopic shift

3. Alpha agonists

Alpha agonists are used as second drug of choice and also in combination with other drugs for the treatment of the glaucoma. The selective alpha agonists lower the intraocular pressure by decreasing the aqueous secretion as well as enhancing the uveoscleral outflow.

- Brimonidine
- Apraclonidine

Side effects
- Arrhythmias
- Mydriasis
- Allergic conjunctivitis
- Nasolacrimal obstruction
- Cystoid maculopathy
4. Carbonic Anhydrase Inhibitors

Carbonic anhydrase inhibitors inhibit the enzyme carbonic anhydrase, which is required for the synthesis of carbonic acid that is further required for the aqueous humor production.

- Dorzolamide
- Acetazolamide
- Brinzolamide

Side effects
- Malaise
- Fatigue
- Renal calculi
- Electrolyte imbalance
- GI Upset
- Blood dyscrasias
- Allergy
- Superficial punctate keratitis
- Nausea
5. Prostaglandin analogs

Prostaglandins act by increasing the uveoscleral outflow of the aqueous humor and thereby, decrease the intraocular pressure.

- Latanoprost
- Travoprost
- Bimatoprost
- Tafluprost

**Side effects**

- Hyperemia
- Iris pigmentation
- Cystoid macular edema
- Allergy
- Headache

6. Hyperosmotic Agents

Hyperosmotic agents increase the serum osmolarity to reduce the intraocular water contents. Hyperosmotic agents are only used in the emergency management of the rise in intraocular pressure such as seen in the angle closure glaucoma and sometimes, before surgery to reduce the intraocular pressure.

- Mannitol 20 % IV solution
- Glycerol 50% oral solution
**Steroids**

Steroids prevent and suppress the inflammation induced edema, fibrin deposition, leucocyte infiltration, scarring and capillary dilation.

- Prednisolone acetate
- Hydrocortisone
- Dexamethasone
- Fluoromethalone
- Medrysone

**Uses of Steroids**

Topical steroids are extremely useful in the management of severe intraocular inflammation e.g., iritis, iridocyclitis, acute dacryocystitis, hordeolum, uveitis, after surgery and after corneal transplant to suppress immune response or transplant rejection.

**Side effects**

- Corneal thinning
- Corneal ulcer
- Potentiation of herpes simplex corneal disease
- Development of elevated intraocular pressure leading to glaucoma
- Formation of cataract
Nonsteroidal Anti-inflammatory Drugs

- Ketorolac
- Indomethacin
- Diclofenac sodium (Voltaren)

Nonsteroidal anti-inflammatory drugs are used for less serious inflammatory or chronic ocular conditions such as dacryocystitis, hordeolum etc. They have less serious side effects of glaucoma and cataract.

Anti-histamines

Anti-histamines are usually used with combination of vasoconstrictors for the treatment of itchy and red eye. They have side effects of rebound phenomenon if over used for prolonged time.

- Sodium chromoglycate, stabilizes the mast cell membrane.

Antivirals

Acyclovir ointment 3% is used for treatment of viral keratitis. Virus activates the drug by the enzyme thymidine kinase inside the cell which stops replication.
Antifungals

Antifungal drugs inhibit the growth of fungi but are not effective as fungicidal agents

- Natamycin is used as a 5% suspension in propylene glycol or as an ointment. It is broad spectrum antifungal used in superficial fungal infections like Fusarium solani, candida infections.

Topical anesthetics

Proparacaine and tetracaine are the most commonly used. Cocaine, while an effective topical anesthetic is very rarely used in clinical ophthalmic practice.

- Proparacaine has rapid onset of anesthesia (About 13 seconds) and has less sting than tetracaine. Proparacaine anesthesia is indicated for removal of foreign bodies, glaucoma testing and for diagnosis of corneal abrasions.

Side effects of Topical Anesthetics

- Epithelial damage & delayed healing
Uses of Topical Anesthetics

- Used in performing tonometry and removing corneal foreign body
- It is also being used as a topical anesthesia for cataract surgery in phacoemulsification.
Artificial Tears
Artificial tears are used for the symptoms of dry, burning eyes. Many lubricating topical drops are available. Non-preserved form should be used if used over 6 times a day. The ointments are usually used at night.

Disclosing Agents
1. Fluorescein
2. Rose Bengal Stain

1. Fluorescein
Fluorescein is a water-soluble, non-toxic dye that is yellow at neutral pH.

Indications
It is indicated in
- Diagnosis of corneal abrasions.
Diagnosis of aqueous leak after surgery.
- Applanation tonometry for diagnosis of glaucoma.
- Angiography of retina.
- Tear layer evaluation in dry eye.

**Rose Bengal Stain**

It stains the devitalized and injured cells rather than location of absent cells. It is used for the diagnosis of dry eye and herpes simplex keratitis diagnosis. Rose Bengal stain has serious side effect of stings that is quite noticeable when the anesthetic wears off.

**Sympathomimetic Agents**

Sympathomimetic agents stimulate the sympathetically innervated dilator muscle. They act as adrenergic stimulating agents. They stimulate dilator pupillae muscle by acting on muscarinic receptors. The effect is enhanced when used with parasympatholytics.

- Phenylephrine
Phenylephrine

Phenylephrine Available as 2.5% and 10%. It is a mydriatic not a cycloplegic. Mild preparations preferred over stronger ones. It is used in combination with tropicamide to get synergistic effect.

Parasympatholytic Agents

Parasympatholytic agents block the action of acetylcholine on the constrictor muscle. They paralyze sphincter pupillae muscle. Almost all are cycloplegics. They act as cholinergic blocking drugs.

Atropine 1%

It is strongest mydriatic, strongest cycloplegic. Its effect may last up to 7 days. It can cause redness of eye and high grade fever, in this case it should be stopped.

Cyclopentolate 1%

It is moderate mydriatic and cycloplegic. Its effect lasts for 48 hours.

Tropicamide 0.5% and 1%

It is also moderate mydriatic and mild cycloplegic. Its effect lasts for 6 to 8 hours.
Uses of Parasympatholytic Agents

1. Fundus examination.
2. Preoperative to cataract and retinal surgery.
3. To break the synechiae.
4. For retinoscopy.

**Antibacterials**

**Sulpha Drugs**

Sulpha drugs are bacteriostatic antibacterials that are used for uncomplicated bacterial conjunctivitis, blepharitis etc. They are effective against most of the ocular pathogens and they have less incidence of hypersensitivity reactions. Sulpha drugs are also used in combination with steroids but should be used upon the ophthalmologist’s prescription.
Aminoglycosides

Aminoglycosides are bactericidal antibacterials and they are used for serious ocular infections, corneal ulcers and post-operative prophylaxis. They have also adverse effect of delayed wound healing. They include streptomycin, gentamycin and amikacin.

Polytrim (Co-trimoxazole)

Polytrim is a combination of trimethoprim sulfate and polymyxin B sulfate. It is a broad spectrum antibiotic and is used against bacterial conjunctivitis.

Chloramphenicol

Chloramphenicol is a broad spectrum and bacteriostatic antibacterial drug.

Fluoroquinolones

Fluoroquinolones include ciprofloxacin, norfloxacin, ofloxacin, etc. They are broad spectrum bactericidal drugs and they are reserved for severe bacterial infections.

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