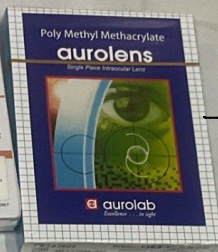
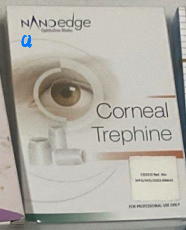
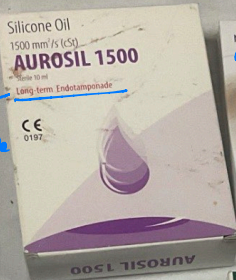


complicaⁿ
 ↳ hyperoleon
 ↳ 2° glaucoma
 ↳ refractive error

vitreoretinal Sx ←

used in retinal
 surgeries as
 intra-ocular tamponade
 agent

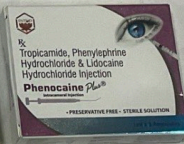
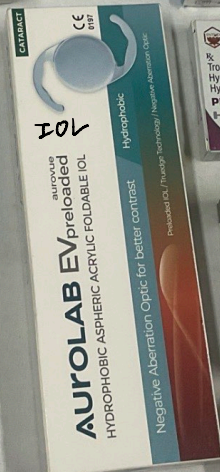
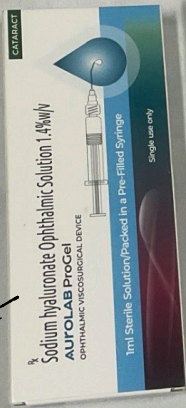


→ IOL - PMMA (rigid)

Corneal Trephine

Circular surgical cutting instrument used to make precise circular incision on cornea

Used in penetrating/lamellar keratoplasty



⑩ dye used for staining the vitreous
TRIAMCINOLONE ACETONIDE
 ↳ in cases of vitreous leak during Sx

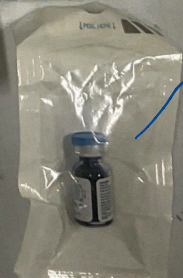
Viscoelastic gel

(used in cataract surgeries)

∴ viscoelasticity to maintain the IOL

← aqueous leaks out

after entering the AC



TRYPAN Blue

⇒ stain anterior lens capsule

COMMON OCULAR SYMPTOMS AND THEIR CAUSES

① Sudden painless loss of vision

- Central retinal artery occlusion
- Massive vitreous haemorrhage
- Retinal detachment involving macular area
- Ischaemic central retinal vein occlusion.

② Sudden painless defective vision

- Central serous chorioretinopathy
- Optic neuritis
- Methyl alcohol amblyopia
- Non-ischaemic central retinal vein occlusion.

③ Sudden painful loss of vision

- Acute congestive glaucoma
- Acute iridocyclitis
- Chemical injuries to the eyeball
- Mechanical injuries to the eyeball.

④ Gradual painless loss of vision

- Progressive pterygium involving pupillary area
- Corneal degenerations
- Corneal dystrophies
- Developmental cataract
- Senile cataract
- Optic atrophy
- Chorioretinal degenerations
- Age-related macular degeneration
- Diabetic retinopathy
- Refractive errors.

⑤ Gradual painful loss of vision

- Chronic iridocyclitis
- Corneal ulceration

⑥ Transient loss of vision (amaurosis fugax)

- Carotid artery disease
- Papilloedema
- Giant cell arteritis
- Migraine
- Raynaud's disease
- Severe hypertension
- Prodromal symptom of CRAO.

⑦ Night blindness (Nyctalopia)

- Vitamin A deficiency
- Retinitis pigmentosa and other tapetoretinal degenerations
- Congenital stationary night blindness *Oguchi's disease*
- Pathological myopia
- Peripheral cortical cataract
- Advanced case of POAG.

⑧ Day blindness (Hemeralopia)

- Central nuclear or polar cataracts
- Central corneal opacity
- Central vitreous opacity
- Congenital deficiency of cones (rarely).

⑨ Defective vision for near only

- Presbyopia
- Cycloplegia
- Internal or total ophthalmoplegia
- Insufficiency of accommodation.

⑩ Black spots in front of the eyes

- Vitreous haemorrhage
- Vitreous degeneration, e.g. senile, pathological myopia
- Lenticular opacity
- Exudates in vitreous.

Reflection (Minimum 200 Words) - 2

TOPIC: Tutorial - Procedure OF SICS

Manual SICS (Small Incision Cataract Surgery)

Is one of the most common & important surgery done for cataract. We learn about steps of it.

Steps are -

1. Superior rectus (Bridle) suture
2. Conjunctival flap & exposure of sclera **PERITOMY**
3. Hemostatic
4. Sclerocorneal tunnel incision (**SELF-HEALING**)
5. Side port entry → inj. viscoelastics
6. Anterior capsulotomy **CCC**
7. Hydrodissection
8. Nuclear management **after enlarging the incision**
9. Aspiration of cortex
10. IOL implantation
11. Removal of viscoelastic material
12. Wound closure

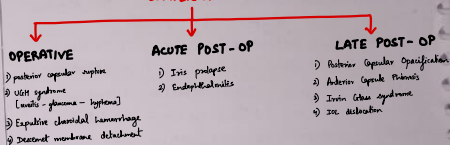
Other steps:-

1. Phacoemulsification

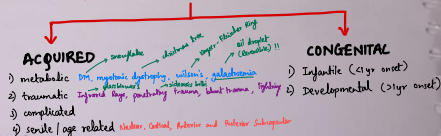
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SICS has merits over conventional fere as well as phacoemulsification technique. Each step here is important & has significance. We also learnt about instruments used in this surgery.

COMPLICATIONS



CLASSIFICATION OF CATARACT









① Nepafenac Ophthalmic Suspension -

NSAID

Uses: To reduce pain & swelling after cataract surgery
 Can also be used for scleritis & episcleritis
 Uveitis
 Cystoid macular edema

} Generally, other NSAIDs used

② Paracaine eye drops

Proparacaine/Broxymetacaine

Topical anaesthetic

③ Moxifloxacin eye drops

4th generation fluoroquinolones

Broad spectrum - Inhibit bacterial DNA synthesis

0.5% 1 to 4 hourly

④ Bimatoprost

Prostaglandin derivatives $PGF_{2\alpha}$ analogue

↓ IOP by decreasing outflow resistance
 i.e. increasing uveoscleral outflow

Given OD

S/E: Conjunctival hyperaemia,

foreign body sensation,

increased pigmentation of iris

⑤ Phenylephrine & Naphazoline } decongestants ⇒ Narrow blood vessels to relieve inflammation
 Menthol & Camphor } cooling effect
 To treat allergic eye disease

⑥ Travoprost & Timolol



~~Travoprost~~ & Timolol

Synthetic PGF₂ analogue

↑ uveoscleral outflow

Nonselective β_1 & β_2 blocker

0.25% & 0.5% eye drops

Effect upto 24 hrs

Short-term escape:

Marked initial fall in IOP,

followed by transient rise with

continued moderate fall in IOP

Long-term drift:

Slow rise in IOP in patients

who were controlled with
many months of therapy

Side effects
of Timolol

→ Ocular:

- Burning & conjunctival hyperaemia
- Superficial punctate keratopathy
- Corneal anaesthesia

Systemic:

- CVS - (β_1 receptor blockade)
Bradycardia, arrhythmia,
Heart failure, syncope

- (β_2) RS - Bronchospasm,
airway obstruction

- CNS - Depression, anxiety,
confusion, drowsiness,
disorientation, hallucinations etc.

- Miscellaneous - Nausea,
diarrhoea, decreased libido,
skin rashes, alopecia,
exacerbation of myasthenia

Indications - Glaucoma (All types)

1st choice in POAG & secondary glaucoma

< Notes



Done

Indications - Glaucoma (All types)

1st choice in POAG & Secondary glaucomas

C/I - Asthma, emphysema, COPD, Heart Blocks,

Congestive Heart Failure, cardiomyopathy

⑦ Moxifloxacin & Dexamethasone



Long-acting steroid

Indications - Uveitis, scleritis, allergic conjunctivitis,

Topical

Preparations

allergic keratitis, cystoid macular edema & after surgery

If used systemically,

Posterior uveitis, sympathetic

ophthalmia, VKH Syndrome,

papillitis, retrobulbar neuritis,

anterior ischaemic optic neuropathy,

scleritis, malignant exophthalmos,

corneal graft rejections etc.

S/E - Topical:

Glaucoma, cataract, activation of infection (in keratitis), dry eye,

Ptosis

Systemic

Papilledema, CRVO,

Peptic ulcer, HTN, osteoporosis,

aggravation of DM, cushingoid changes,

mental changes, reactivation of TB etc.

⑧ Fluconazole

Fungistatic drug



⑧ Fluconazole

Fungistatic drug

Candida, Aspergillus, Cryptococcus

Oral (50-100 mg) & Topical (0.2% eye drops)

Imidazole group - Block biosynthesis of ergosterol

Result in leakage of cell contents

⑪ Tropicamide

0.5%, 1%

Not used as cycloplegic for retinoscopy; only as mydriatic

4-6 hrs - Duration of action

Effect within 30 minutes

Anticholinergic

⑫ Brinzolamide

Carbonic anhydrase inhibitor

Decrease aqueous humor production

Administered twice daily (BD)

Indications: 2nd line & adjunct for treating glaucoma

Side effects: • Paraesthesia

• Urine frequency - d/t diuretic effect

• Serum electrolyte imbalances:

Bicarbonate depletion → metabolic acidosis
[Malaise symptom complex]

↓
Malaise, anorexia, weight loss,
fatigue, depression, loss of libido

Potassium depletion

Ser. sodium & chloride

• GI symptom complex

• Sulfonamide related side effects:

Renal calculi, Blood dyscrasias,



↓
Malaise, anorexia, weight loss,
fatigue, depression, loss of libido

Potassium depletion

ser. sodium & chloride

- GI symptom complex
- Sulfonamide related side effects:
Renal calculi, Blood dyscrasias,
Stevens-Johnson syndrome,
transient myopia, hypertensive retinopathy

⑬ Gatifloxacin

4th generation fluoroquinolone

0.3%. 1 to 4 hourly

⑭ Vitamin A Palmitate & Carbomer ophthalmic gel

- Reduce dry eye symptoms related from long-term use of prostaglandin analogues for glaucoma
- Increase goblet cell density & reduce toxicity to conjunctiva

⑮ Brimonidine tartrate & Timolol

↓

Selective α_2 agonist

↓ aqueous production & ↑ uveoscleral outflow

Administered twice daily

⑯ Prednisolone

Short acting corticosteroid

[Same as dexamethasone]

⑰ Carboxymethylcellulose

To treat dry eyes, irritation

⑱ Latanoprost

PG F₂ analogue



⑮ Carboxymethylcellulose

To treat dry eyes, irritation

⑯ Latanoprost

PG $F_{2\alpha}$ analogue

Given OD

Same as Bimatoprost

⑰ Dorzolamide

Topical carbonic anhydrase inhibitor

S/E: Burning sensation, Local allergic reaction

Good corneal penetration

⑱ Azithromycin

Macrolide

Very effective

Broad spectrum ?

⑲ Cyclopentolate

• Short acting cycloplegic (6-18 hrs)

• 1% in 8-20 yrs

• 1 drop every 10-15 minutes for 3 times (Hareness's recommended dose)
↓
Retinoscopy 90 minutes later

⑳ Betamethasone + Neomycin

• long acting corticosteroid
• eye drop / ointment

• Broad spectrum aminoglycoside

• Both gram -ve & gram +ve bacilli

• Pseudomonas & Strep. Pyogenes → NOT SENSITIVE

• Toxic to ear, kidney → ∴ used topically (0.3-0.5%)

↓
Retinoscopy 90 minutes later

recommended dose)

(d) Betamethasone + Neomycin

- ↓
- long acting corticosteroid
- eye drop / ointment

- ↓
- Broad spectrum aminoglycoside
- Both gram -ve & gram +ve bacilli
- Pseudomonas & Strep. pyogenes → NOT SENSITIVE
- Toxic to ear, kidney → ∴ used topically (0.3-0.5%)

(i) HPMC Ophthalmic solution

↳ To relieve dry, irritated eyes

Drug can be delivered to ocular tissue as:

LOCALLY:

- eye drop
- ointment
- periocular injection
- intraocular injection

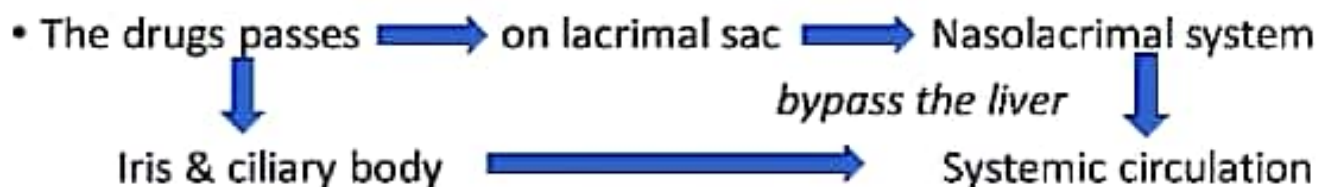
SYSTEMATICALLY:

- oral
- intravenous

EYE AND TOPICAL MEDICATIONS

Tear Film

- Under normal circumstances the volume of tear fluid is 5-7 μl with normal rate of secretion about 1-2 μl /min
- Drop added cause an increasing in blinking, squeezing which propels tears towards the sac.



DRUG DELIVERY IN EYES

• Topical

- Drop
- Ointment
- Gel

• Periocular

- Subconj.

➤ Subtenon

- Peribulbar → (mc) for anesthesia + akinesia prior to surgery

➤ Retrobulbar

• Intraocular

- Intracameral

- Intravitreal

• Systemic

- Oral ✓
- Intravenous ✓
- Intramuscular ✓

not used x
dangerous
(injury to ON,
retrobulbar
hemorrhage)

{ lateral 1/3
medial 2/3
inferotemporal

@ supraorbital
notch
superomedial

pars plana



MYDRIATRICS AND CYCLOPLEGICS AGENTS

MYDRIATICS

- Only mydriasis
- Care should be taken in older patients
- **Phenylephrine** ✓

CYCLOPLEGICS

- Along with mydriasis paralysis of accommodation
- parasympatholytic agents are commonly used
- Blocks the action of cholinergic stimulation causing paralysis of accommodation and pupillary dilation (*anticholinergics*)
- **Atropine sulfate** ✓
- **Homatropine hydrobromide** ✓
- **Cyclopentolate hydrochloride** ✓
- **Tropicamide**

↓
mydriatic only

PHENYLEPHRINE (2.5 %)

- Direct acting drug.
- Pupil dilation for diagnostic purpose
- Most common sympathomimetic agent used
- Acts on alpha 1 receptors of the dilator pupillae
- Indication
 - Refraction
 - Subacute or chronic ACG after
 - Before Intraocular surgery



- **Contraindication**

- Narrow angle glaucoma.
- Hypertensives.
- Type 1 diabetes mellitus.
- Aneurysms.
- Cardiac diseases
- Patients on reserpine
- Infants

- **Adverse effects**

- – Mild stinging
- – HTN, headache, browache

- **Dosage**

- – 1 or 2 drops for each refraction 2.5% solution

ATROPINE

- Atropine sulfate is anticholinergic – 0.5%, 1%, 3%

- Strongest drug in cycloplegics

- Inhibitor of muscarinic action of acetylcholine

- Indication

- Mydriasis & cycloplegia. ✓

↗ anterior uveitis (↓ pain) ∴ cause of pain is
CB spasms ✓

- Pupil dilation in inflammatory condition of iris.

- Amblyopia therapy

- To prevent formation of synechie and to break already formed synechie.



- **Contraindication**
- – 1° glaucoma
- – Hypersensitive
- **Adverse effects**
- – Allergic responses
- – Blurred vision
- – Photophobia
- – Dryness of skin & mouth
- – Skin rash
- **Dosage**
- – 1 or 2 drops 0.5% to each eye, twice daily for 1 to 3 days prior to examination

HOMATROPINE

- First anticholinergic
- Directly blocks muscarinic action of acetylcholine
- Its effect last for longer time
- Indication
 - Cycloplegic refraction
 - Treatment of inflammatory uveal tract condition

↪ Anterior uveitis



- **Contraindication**

- – Tendency with occludable angles
- – Patient who have allergic to atropine

- **Adverse reaction**

- – Follicular conjunctivitis
- – Vascular congestion
- – Edema exudate

- **Dosage**

- – 1 or two drops repeated in 5 to 10 minute if necessary

Cyclopentolate

- Cyclopentolate hydrochloride 1% is an anticholinergic
- **Indication**
 - Cycloplegics of children under the age 12 to 20 yrs
- **Contraindication**
 - Narrow angle glaucoma
 - Hypersensitive
 - Children with emotional problems
- **Adverse effects**
 - Increased IOP, blurring of vision, photophobia
 - Dryness of mouth, headache or allergic reactions
- **Dosage**
 - One drop followed by second drop in 5 minutes of arc

TROPICAMIDE

- **Most common** anticholinergic mydriatic drug
- Stronger – 1%, paralysis accommodation ✓
- 0.5% produce mydriasis with slight cycloplegia
- Indication
 - – Diagnostic process
 - – Pre and post operative stages
 - – Infants – combination with phenylephrine



DRUG	AGE	STRENGTH OF SOLUTION %	MYDRIASIS	
			MAXIMAL	RECOVERY
Atropine ^{drops/ointments}	<u><5 years</u>	1%	30 - 40min	<u>7 - 10 days</u>
Homatropine	<u>5 - 8 years</u>	2%	30 - 40min	1 - 3 days
Cyclopentolate	8 - 20 years	0.5 - 1%	30 - 60min	24 hours
Tropicamide not a cycloplegic x only mydriatic	<u>20 - 40 yrs</u> (Adults)	0.5 - 1%	<u>20 - 40min</u>	<u>6 hours</u>

most potent

mc used

nothing required
(accommodation is relaxed dlt age)

> 40 yrs

shortest acting & fast recovery

ANTI-INFLAMMATORY AGENTS

- **Non – steroidal**
 - Topical :- Flurbiprofen sodium
 - Systemic :- Keterolac tromethamine
- **Steroidal**
 - Topical :- Fluoromethelone
 - Systemic :- Prednisolone

OCULAR INDICATIONS FOR USE OF NSAIDs

- prevention of intraoperative miosis
- reduction of postoperative inflammation
- prevention and treatment of cystoid macular edema
- non infectious uveitis
- scleritis and episcleritis
- allergic and giant papillary conjunctivitis
- after refractive surgery

FLURBIPROFEN SODIUM

- Inhibit the cyclo-oxygenase enzyme
- Indication
 - Inhibition of intraoperative miosis, maintenance of dilatation
 - Postlaser & postoperative ant. segment inflammation
- Contraindication
 - Dendritic keratitis (Viral - Herpes simplex)
 - Patient with bleeding tendency
- Adverse effect
 - Transient burning, Stinging
- Dosage
 - Total 4 drops instilling 1 drop in every 30 min, 2hrs before surgery



KETEROLAC TROMETHAMINE

- Available in 0.5% sol.
- Inhibit prostaglandin biosynthesis
- **Indication**
 - – Ocular itching due to seasonal allergic conjunctivitis
 - – Post excimer surgery
 - – Pain management
 - – Chronic conjunctivitis
 - – Cystoid macular edema



- **Contraindication**

Soft Contact Lens wearer

- **Adverse effects**

- Transient stinging & burning sensation

- Ocular irritation

- Allergic reaction

- Superficial keratitis

- **Dosage**

- 1 drop 4 times/day

Newer drug

- Nepafenac 0.1% and Bromfenac 0.09% are topical, nonsteroidal anti-inflammatory, recently introduced
- Nepafenac is a prodrug, converted by ocular tissue hydrolases to **amfenac**, which inhibits the action of prostaglandin H synthase (cyclooxygenase)
- Indicated for the treatment of post operative pain and inflammation, cystoid macular edema.

B.CORTICOSTEROIDS

- Useful in control of inflammatory and immunological diseases of eye.
- Routes of administration-Topical, Periocular, Intravitreal, Ora, Intravenous
- Their anti-inflammatory and immunosuppressive action
 - inhibition of **lymphocytes proliferation**, with a decrease of the cell mediated immunity
 - inhibition of the **degranulation** of neutrophil granulocytes, macrophages, mastcells and basophil granulocytes.
 - decrease of **vascular permeability**
 - decrease of **prostaglandin production**

Indications

- post surgical inflammation
 - allergic conjunctivitis and blepharitis
 - vernal conjunctivitis, phlyctenular keratoconjunctivitis
 - disciform and interstitial keratitis
 - corneal graft rejection
 - scleritis and episcleritis, anterior and posterior uveitis
 - traumatic inflammation of the eye
 - papillitis and retrobulbar neuritis
 - sympathetic ophthalmia
 - herpes zoster ophthalmicus
 - orbital pseudotumor
 - VKH syndrome
- ankylosing spondylitis (HLA B27)
- PANUVEITIS

Contraindications

TOPICAL	SYSTEMIC
• acute viral infections ✗ • fungal diseases • ocular TB ✗ • acute conjunctivitis ✗ • caution in <u>pregnancy</u> and <u>lactation</u>	S- psychosis, headaches, pseudotumour cerebri. T- <u>thrombosis (venous)</u> E- endocrinal- suppressed hypothalamic pituitaryadrenal axis, retarded growth, <u>cushingoid state</u>. R- retention of fluid & sodium but loss of potassium & systemic alkalosis. O- <u>osteoporosis</u> & myopathies. I- immunosuppression with secondary infections esp. <u>TB</u> & fungal, D- <u>diabetes</u> & <u>hypertension</u>, duodenal & gastric (<u>peptic</u>)ulcers.]

Side effects

TOPICAL	SYSTEMIC
• glaucoma ✓ • cataract (PSC) ✓ • dry eye ✓ • reduced resistance to bacterial, fungal and viral infections and secondary infections • scleral melting • <u>delayed wound healing</u> • eyelid skin atrophy	• ocular • suppression of hypothalamic pituitary adrenal axis • hyperglycemia • peptic ulcer • osteoporosis • psychiatric disturbances • cushing's habitus • fetal abnormalities • susceptibility to infections

TOPICAL CORTICOSTEROIDS

Available as solution, suspension and ointment

- Hydrocortisone 0.5-1.5%
- Prednisolone 0.12, 0.25, 1 %
- Dexamethasone 0.1%
- Betamethasone 0.1 %
- Triamcinolone 0.1%
- Fluomethalone 0.1%
- Loteprednol 0.2%,0.5%
- Difluprednate 0.005%
- **Anti-inflammatory action *** prednisolone acetate > fluorometholone acetate > dexamethasone acetate > betamethasone

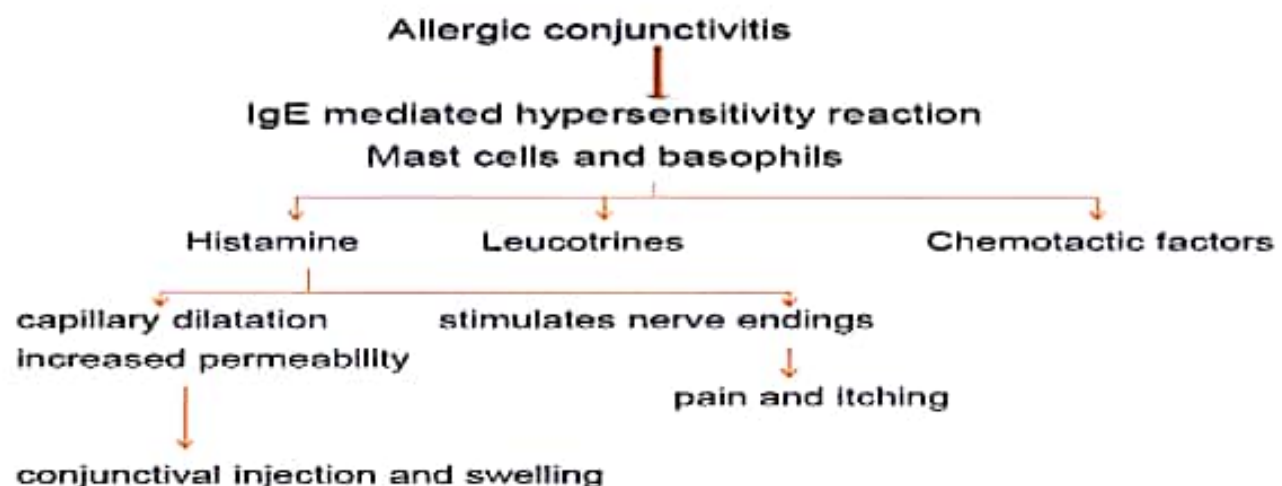
- Rise in IOP- maximum rise due to dexamethasone (0.1%) and fluorometholone 0.1% is least
- Loteprednol 0.2%- “soft” steroid- minimal effect on IOP & systemic side effects, approved for allergic conjunctivitis and combined with tobramycin 0.3% for superficial bacterial infection with inflammation
- Triamcinolone acetonide (40mg/ml) (Kenacort) was approved by FDA in 2007 for intraocular use in visualization during vitrectomy, chronic non infectious uveitis, diabetic macular edema

ORAL CORTICOSTEROIDS

Short acting	Hydrocortisone	20mg/day	➤ rapid acting mineralocorticoid activity
	Cortisone	20-100mg/day	
Intermediate	Prednisolone	1-2mg/kg/day	➤ 4 times more potent than hydrocortisone
	Methyprednisolone	4-32mg/day	➤ Selective than prednisolone
	Triamcinolone	4-32mg/day	➤ Only glucocorticoid action
Long acting	Dexamethasone	0.5- 5mg/day	➤ Highly selective glucocorticoid
	Betamethasone	0.5- 5 mg/day	➤ Marked pituitary axis suppression

MAST CELL STABILIZERS AND ANTIHISTAMINES

- Human eye has about 50 million mast cells, which contains preformed chemical mediators.



Class	Generic name	Mechanism	Dosage	Side effects
Mast cell inhibitor	Cromolyn sodium	inhibit neutrophil, eosinophil, monocyte	0.01% BD	does not provide immediate relief
H1 antagonist + mast cell inhibitor	Azelastine HCL	provides immediate relief and prevent further degranulation	0.05% BD	ocular burning, stinging, dry eye
	Epinastine HCL			
	Ketotifen fumarate			
	Nedocromil sodium			
	Olopatadine		0.05%, 0.01% BD/OD	
H1 antagonist + decongestant	Naphazoline HCL/phenaramine maleate	short term relief for mild allergy	0.05%/0.01% BD	

ANTI BACTERIAL DRUG

1.FLUOROQUINOLONES

It inhibit bacterial DNA synthesis include fluorinated quinolones (fluoroquinolones),

- Lomefloxacin
- Norfloxacin
- Ciprofloxacin
- Sparfloxacin
- Germifloxacin
- Levofloxacin
- Gatifloxacin
- Moxifloxacin

2.Aminoglycoside

- Inhibit bacterial protein synthesis by binding to 30s subunit of the bacterial ribosome.

- Include:-

Gentamicin

Tobramycin

Neomycin

amikacin

- **Neomycin** :- Active against most gram –negative bacilli and some gram-positive cocci
- **Gentamicin**:- To a variety of bacterial infections of the external eye and conjunctivitis, blepharitis ,kerato-conjunctivitis and bacterial corneal ulcers.
- **Tobramycin**:-Treatment of corneal ulcer.
Used in conjunctivitis in children.
- **Amikacin**:-Treatment of bacterial endophthalmitis.

Side effect- auditory and vestibular ototoxicity, Nephrotoxicity, Corneal toxicity – punctate epithelial erosions/delayed reepithelization and corneal ulceration, Conjunctival toxicity –chemosis, hyperemia and necrosis.

3. Tetracyclines

→ ⊖ Protein Synthesis

- These are broad-spectrum bacteriostatic agents with a considerable action against both gram-positive and gram – negative organisms as well as some fungi

USES

- In adults with chlamydial ocular infection such as inclusion conjunctivitis or trachoma.
- Noninfectious condition eye such as acne rosacea or meibomianitis
- Resolving noninfective corneal ulcers or 'corneal melting'.

SIDE EFFECT- Heartburn , nausea , vomiting ,diarrhea, azotemia in patients with impaired renal function, Bone growth depression and tooth discoloration

4. Chloramphenicol

It is bacteriostatic. It inhibits bacterial protein synthesis by binding to 50s ribosomal subunit.

Uses:-

- Active against most gram-positive and gram-negative bacteria
- Effective against most bacterial infections of the external

Side effects:-

- Dose-related toxic effect causes bone marrow depression
- Bone marrow depression consists of aplastic anemia

5. Drugs affecting cell wall synthesis

- Include :-
- Penicillin
- Cephalosporins
- bacitracin
- Vancomycin

Penicillin

The penicillin act by inhibiting synthesis of the bacterial cell wall. It is Bacteriocidal agents.

USES-

- Generally more effective against gram-positive organisms
- Treatment of syphilis and syphilitic eye disease (stromal inflammation and vascularisation, episcleritis, scleritis, papillitis, retinal vasculitis, exudative retinal detachment), preseptal cellulitis.

SIDE EFFECT- Hyper-sensitivity responses, Pain and tenderness at the site of an intramuscular injection, Central nervous system include headache, dizziness, confusion

Cephalosporins

First-generation:- cephradine , cephalexin , cefadroxil , cefazolin

Uses:-all act effectively against gram –positive bacteria ,corneal ulcers.

Second –generation:- Include:-cefaclor, cefuroxime ,cefoxitin , cefotetan

Uses:-mild preseptal cellulitis.

Third –generation :- Include:- cefotaxime , cefixime , cefotetan

Uses:-endophthalmitis,preseptal cellulitis,gonococcal ophthalmia neonatorum.

Fourth –generation:- Include:-cefepime

Uses :-activity for both gram- negative and positive organisms.

SIDE EFFECT- Decreased renal function, Unusual serum sickness,Breast cancer and Vitamin k deficiency may developed

ANTI - VIRAL DRUGS

- Locally given to the eye
- ^{Keratitis} HSV, HZV, CMV retinitis
- Common drugs
 - – Acyclovir
 - – Vidarabine
 - – Ganciclovir

ACYCLOVIR

- Can enter the sequence of DNA formation only in cells infected by virus
- Used as topical therapy of **viral keratitis**
- Systemically used in **Herpes zoster ophthalmicus** & acute retinal necrosis
- **Contraindicated** in person with hypersensitivity ✕
- **Adverse reaction**
 - – Local – **SPK** (*superficial keratopathy*)
 - – Systemic – **nausea, vomiting, headache, anorexia, dizziness and fatigue**
- intravenous can potentiate nephrotoxicity
- **Dosage**
 - – Topical – **3%, 5 times/day**
 - – Systemic – 800mg, 5 times daily for 7 – 10 days
 - – Intravitreal – 10 – 40µg/0.1ml



stop drug if metaherpetic ulcer ⊕

GANCICLOVIR

- Indication

- **CMV retinitis** *Pizza pie appearances*

- Progressive outer retinal necrosis

- **Contraindication**- Pregnant women, Hypersensitivity patient

- **Adverse effects** – Myelosuppression, Nephrotoxicity, Elevation of liver enzymes

- Dosage

- ~~• Oral~~ – 10mg/kg body wt/dose 4-5 times/day

- ~~• Intravenous~~ – 5mg/kg over 1 hr every 12hr for 14 – 21 days

- ~~• Intravitreal~~ – 2000 - 400µg/0.1ml



ANTI – FUNGAL DRUGS

Common drugs

- – Natamycin
- – Amphotericin B

NATAMYCIN

- Derived from *Streptomyces natalensis*
- Topical administration produces effective conc. of natamycin in corneal stroma but not in the intra ocular fluid
- Indication
 - – Fungal blepharitis
 - – Conjunctivitis
 - – Keratitis (DOC for Aspergillus and Fusarium)
- Contraindication- Hypersensitivity
- Adverse reaction- Conjunctival chemosis, Hyperemia, Allergic
- Dosage— 1 drop hourly or 2 hourly intervals for 14 – 21 days



AMPHOTERICIN B



- Derived from a strain of *Streptomyces nodusus*
- Bind to sterol in fungal cell membrane.
- **Indication**
 - Sterilization of corneal ulcers
 - Mycotic keratitis
 - Intraocular histoplasmosis
 - Candida keratitis ✓
- **Contraindication-** Patient with nephropathy, Hypersensitive
- **Adverse effects-** Local Irritation, Nausea, Vomitting, Diarrhoea, Renal damage – if dosage exceeds 3mg
- **Dosage**
 - Topical – 0.15%
 - Subconjunctival – 0.5mg to 1mg
 - Systemic – intravenous : 0.1mg/cc
intravitreal : 5-10µg/0.1ml

OCULAR LUBRICANTS

- Available as ^{CMC} drops, ^{carbomer} gels and ^{paraffin} ointments

Indication

- protection and lubrication
- exposure keratitis**, decreased corneal sensitivity, **recurrent corneal erosions**.

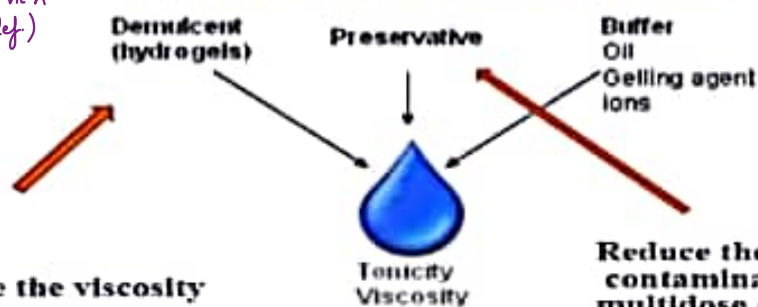


facial nerve palsy

keratoconjunctivitis sicca

dry eye (eg. vit A def.)

Important Artificial Tear Components

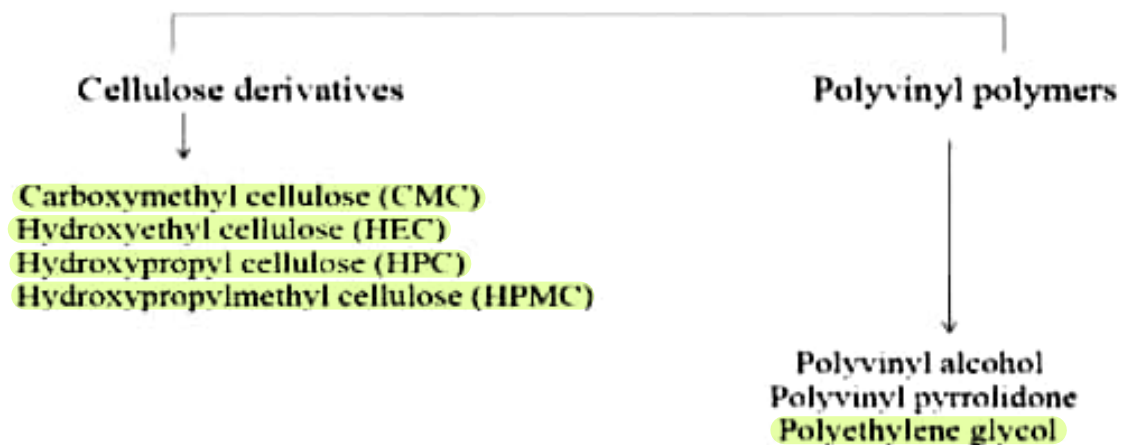


Hydrogels are the viscosity enhancing active ingredients of artificial tears

Reduce the risk of bacterial contamination in multidose containers, and to prolong shelf life. E.g. benzalkonium Chloride, oxychloro complex

Adverse effects of tear substitute- redness, stinging and temporary blurring of vision, hypersensitivity reactions.

- Various tear substitutes available can be categorized as-



CELLULOSE DERIVATIVES	POLYVINYL ALCOHOL BASED
polysaccharides	synthetic polymer
mix well with other ophthalmic products	does not mix well with other ophthalmic products
only benefit in aqueous deficiency	beneficial in lipid, aqueous and mucin layer deficiencies
hypromellose can cause crusting of lids mimicking blepharitis	short retention time on ocular surface
available as 0.5%, 1% solution	1%, 1.4% solution
blurring of vision is common	water soluble, does not blur vision

ANTI GLAUCOMA

Beta blockers		Alpha Agonists (sympathomimetics)	Prostaglandin analogues	Carbonic anhydrase inhibitors	Cholinergic (parasympathomimetic)
Non selective	Selective				
Timolol	Betaxolol	Brimonidine 0.2%	Latanoprost 0.005%	Dorzolamide 2%	Pilocarpine
Levobunolol		Apraclonidine 0.5-1%	Bimatoprost - 0.03%	Brinzolamide 1%	Carbachol
Metipranolol		Dipivefrin 0.1%	Travoprost - 0.004%		
Carteolol		Epinephrine 1-2%	Unoprostone 0.15%		

TOPICAL ANAESTHESIA

PARACAINE

ADVANTAGES:

- Cost effective
- Immediate visual recovery
- Avoidance of complication - globe rupture , nerve damage

DISADVANTAGES:

- No akinesia
- Not suitable for extended surgery
- Well informed and motivated patient is required



ADVERSE EFFECT OF TOPICAL ANAESTHESIA

- Epithelial and Endothelial toxicity
- Allergy to drug
- Alteration of lacrimation
- Surface keratopathy

USES OF TOPICAL ANAESTHESIA

- **Manipulation of superficial cornea and conjunctiva**
- **Phacoemulsification in cooperative patient**
- **Prior to regional blocks**

↳ peribulbar
↳ retrobulbar

DRUGS	MOA	Side Effects
1) Prostaglandin $F_{2\alpha}$ Analogues ($PGF_{2\alpha}$) Latanoprost 0.005% Bimatoprost 0.03% Travoprost 0.004% Tafluprost $\rightarrow$ only preservative free good compliance Doc for open-angle (expensive drug)	$\uparrow$ uveoscleral outflow	- Hyperpigmentation of iris - Hypertrichosis ($\uparrow$ eyelashes) $\rightarrow$ Bimatoprost is FDA approved for tlt of hypotrichosis - Uveitis - Cystoid macular edema (CME) ✓ - Reactivation of herpes keratitis - Iris cyst • orbital fat atrophy
2) β-Blockers Non-selective $\beta \ominus$ Timolol 0.25%, 0.5% BD Selective $\beta \ominus$ Betaxolol 0.25%	max. reduction of IOP (30%) $\downarrow$ aqueous production Doc for open angle in low SES pts	- Blepharoconjunctivitis - NLD blockage - corneal anesthesia - Aphakic CME (specific to Betaxolol) Nausea, diarrhea, $\downarrow$HR (C/I $\rightarrow$ asthma, COPD, heart block, CHF)
3) Carbonic Anhydrase Inhibitors Acetazolamide (oral) Brinzolamide Dorzolamide Rx of childhood glaucoma	$\downarrow$ aqueous production	can cause hypersensitivity in patients with sulfa allergy
4) α-Agonist (α_2) Apraclonidine Doc for post-laser rise in IOP. (preferred for glaucoma)	$\downarrow$ aqueous production $\uparrow$ Trabecular outflow	- Eyelid retraction - Mydriasis - Follicular conjunctivitis
Brimonidine (2nd line drug)	$\downarrow$ aqueous production $\uparrow$ uveoscleral outflow	CNS suppression (d/t BBB cross) - drowsiness, depression, apnea, bradycardia } C/I in children

* Prodrug of Adrenaline
Dipivefrin
(NOT USED)

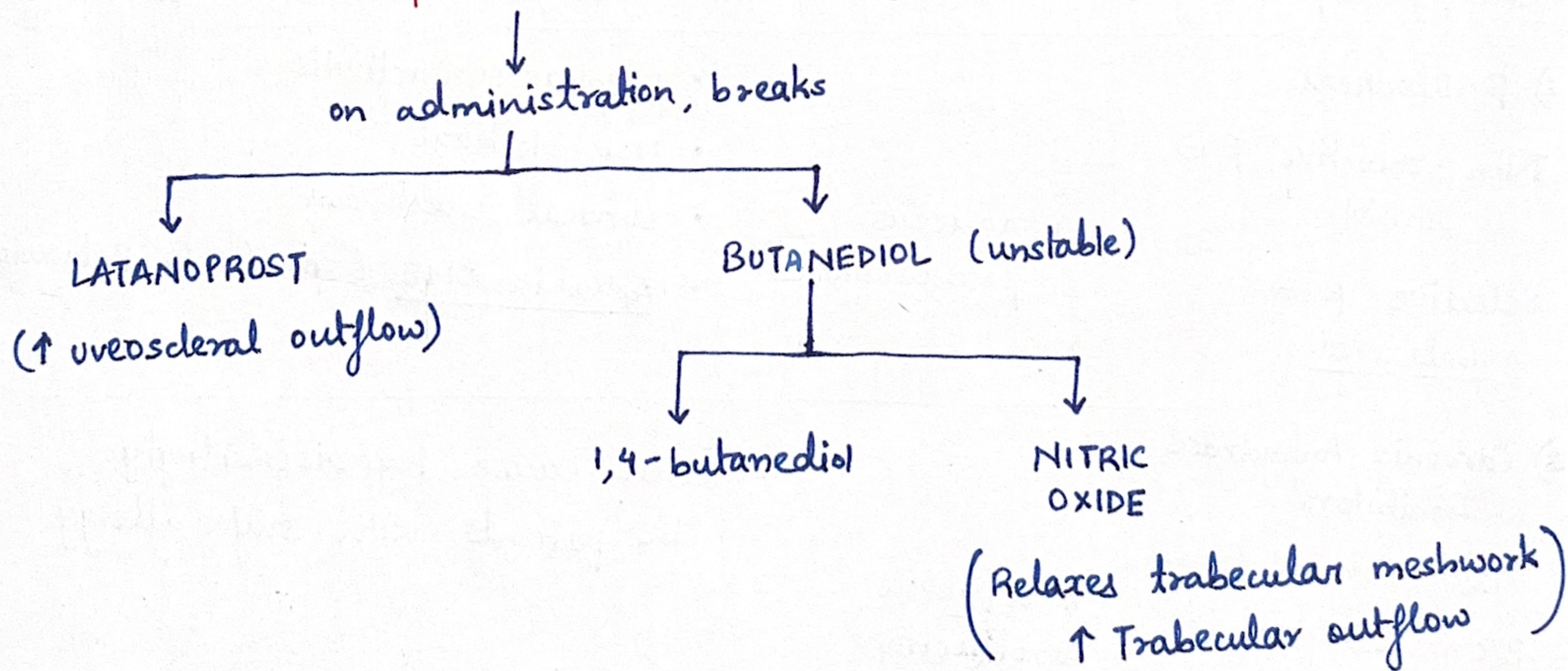
Black conjunctival pigmentation

5) Rho Kinase $\ominus$
Netarsudil
Dose $\Rightarrow$ 0.02% OD

$\downarrow$ aqueous production
 $\uparrow$ trabecular outflow
(promoting actin-myosin contraction)
($\downarrow$ Episcleral venous pressure)

- congestion / hyperemia
- **corneal verticillata**
(spindle shaped deposits)
- **subconjunctival hemorrhage**

6) Nitric oxide donating prostaglandin analogue:
Latanoprostene Bunod (prodrug)



PILOCARPINE (miotic)

DOC for closed-angle

- Ineffective before IOP normalizes (d/t inability to constrict if $\uparrow$ IOP)
- ocular side $\Rightarrow$ **Transient myopia**, **Punctal occlusion**, **Uveitis**, **Post synechiae**
- cannot be given long term d/t miosis [impaired dark adaptation]

For acute angle closure

IV Mannitol (25%) 1.2g/min over 30 mins $\rightarrow$ DOC for acute episode OR

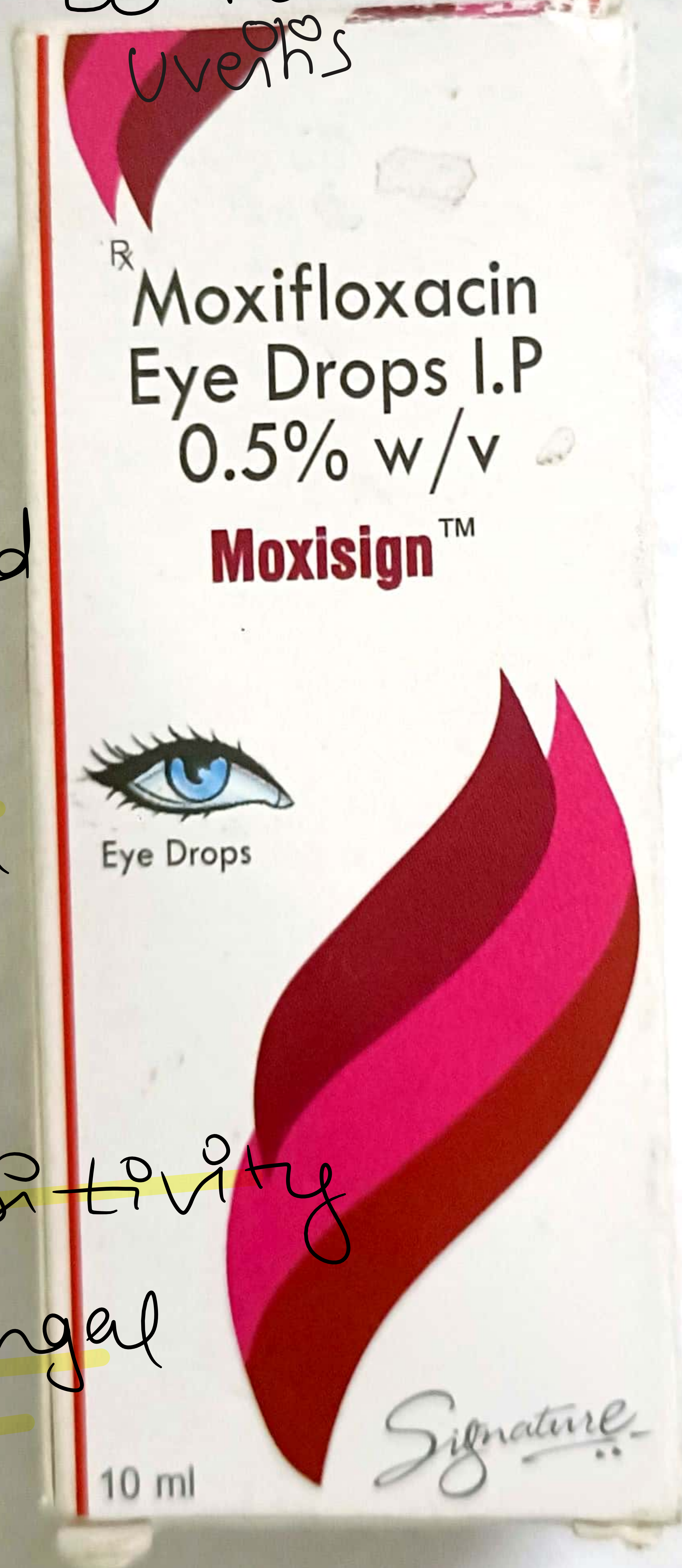
Tab. Acetazolamide 250mg $\times$ 2 stat OR

Oral Glycerin 1g/kg of Body Weight

- 4th gen fluoroquinolones
- Inhibits ^{⊖ DNA Gyrase} topoisomerase II & IV
- Bactericidal (effective against both Gram ⊕ & Gram ⊖)
- Uses - Bacterial conjunctivitis
- Blepharconjunctivitis
- Bacterial corneal ulcer
- uveitis

- SIE
- dry eye,
- temp-blurred vision,
- conjunctival hyperaemia

- C/I
- Hypersensitivity
- Viral / fungal infections



Dose:

0.5-1.1
drop 3 times
a day,
5-7 days

1-4 hrly
7th

- Antimuscarinic - blocks M₃ receptors & causes mydriasis & cycloplegia

Uses: (1) Anterior uveitis (relieves pain, photophobia & prevents post synechiae formation) + diagnostic mydriasis

- (2) Eye exam
- (3) IOL implant
- (4) Corneal ulcer

S/E:

- Blurred vision
- photophobia

- ↑ IOP
- dry mouth
- facial flushing

HOMATROPINE
HYDROBROMIDE
EYE DROP IP
HOMIDE®

ML =

MRS. PARUBAI R.
PRN: 420259 Age
Visit: IP-3 Dt.:
Consultant: Dr. S.

Dose:

2% 1 drop
2-3 times
daily for
1-3 days

CI:

- Angle closure glaucoma ✓
- Hypersensitivity ✓

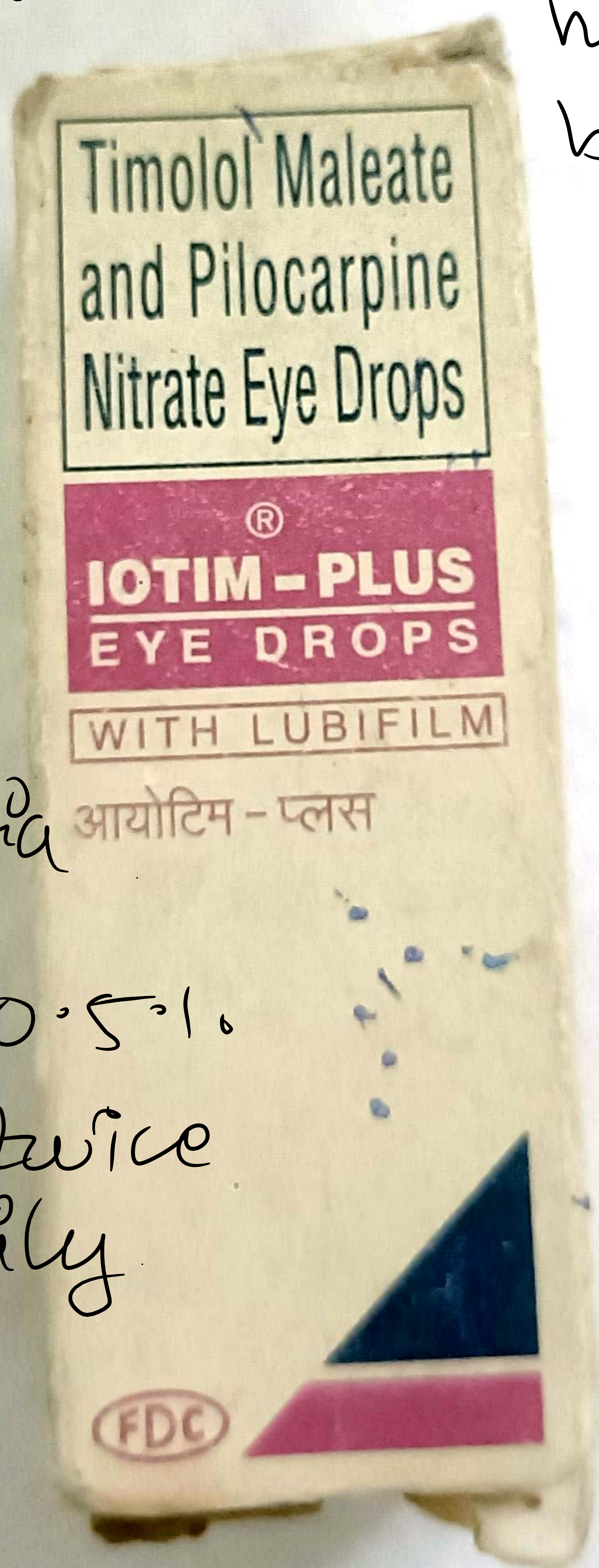
Timolol Maleate β blocker which $\downarrow$ IOP
by $\downarrow$ aqueous humor production
uses: Primary open angle glaucoma
chronic angle closure glaucoma
ocular HTN

S/E: Dry eye, blurred vision,
hypotension,
bradycardia,
bronchospasm

C/I:

- COPD
- Asthma
- sinus bradycardia

Dose - 0.25 / 0.5%
1 drop twice daily



Pilocarpine

$\downarrow$
sympathomimetic
- $\downarrow$ IOP by
 $\uparrow$ aqueous outflow

Topical corticosteroids which ↓ PGE
 synthesis. ↑ Capillary permeability, suppress immune system
 - Uses: Uveitis, Allergic conjunctivitis,
 Keratitis, Scleritis, Cystoid macular
 edema

S/E:

→ ↑ IOP

- Post-
 subcapsular
 cataract

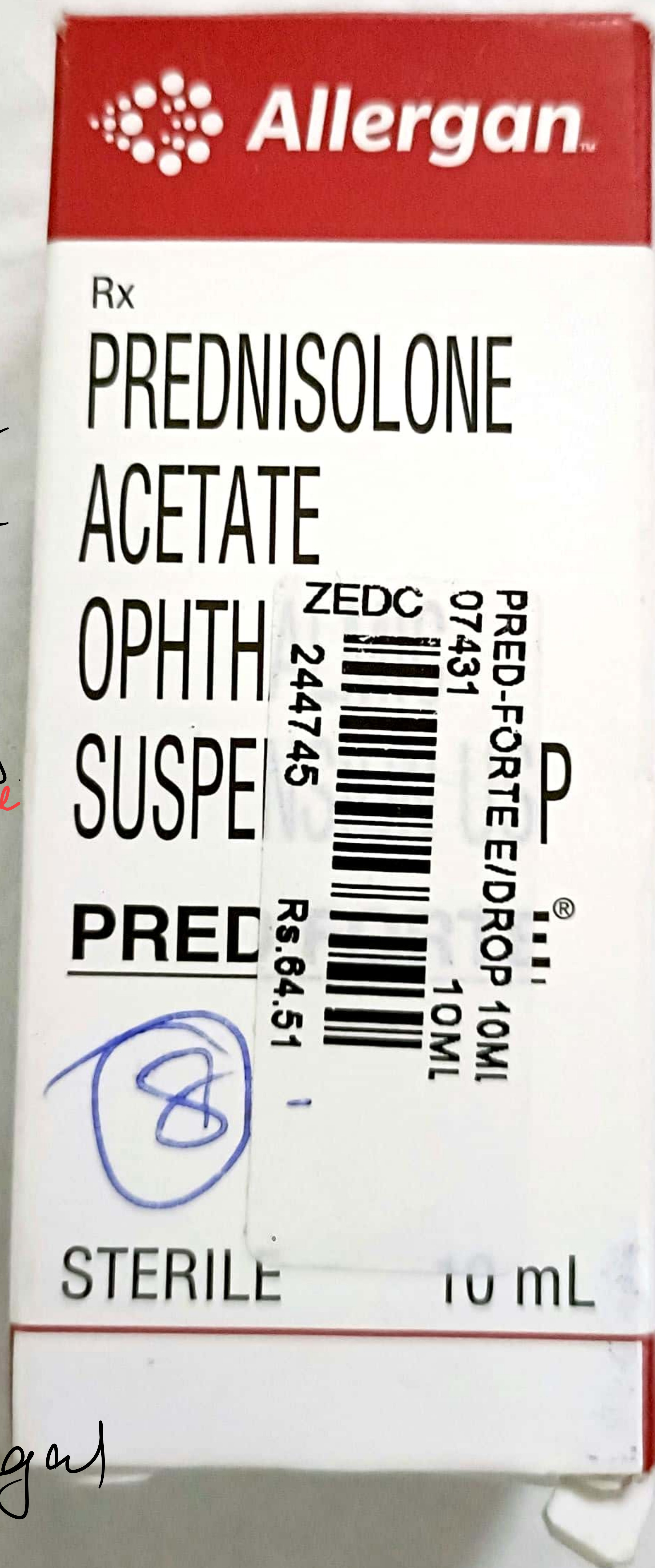
- ↑ risk of
 infections
 ∵ suppresses immune
 system

C/I:

- Glaucoma

- Corneal
 epithelial
 defects

- Viral, fungal
 keratitis



1%
 suspension,
 1 drop,
 4-6 times
 a day

Artificial tears

Uses:

Dry eye disease
contact lens induced dryness
computer vision syndrome
Exposure keratitis

S/E:

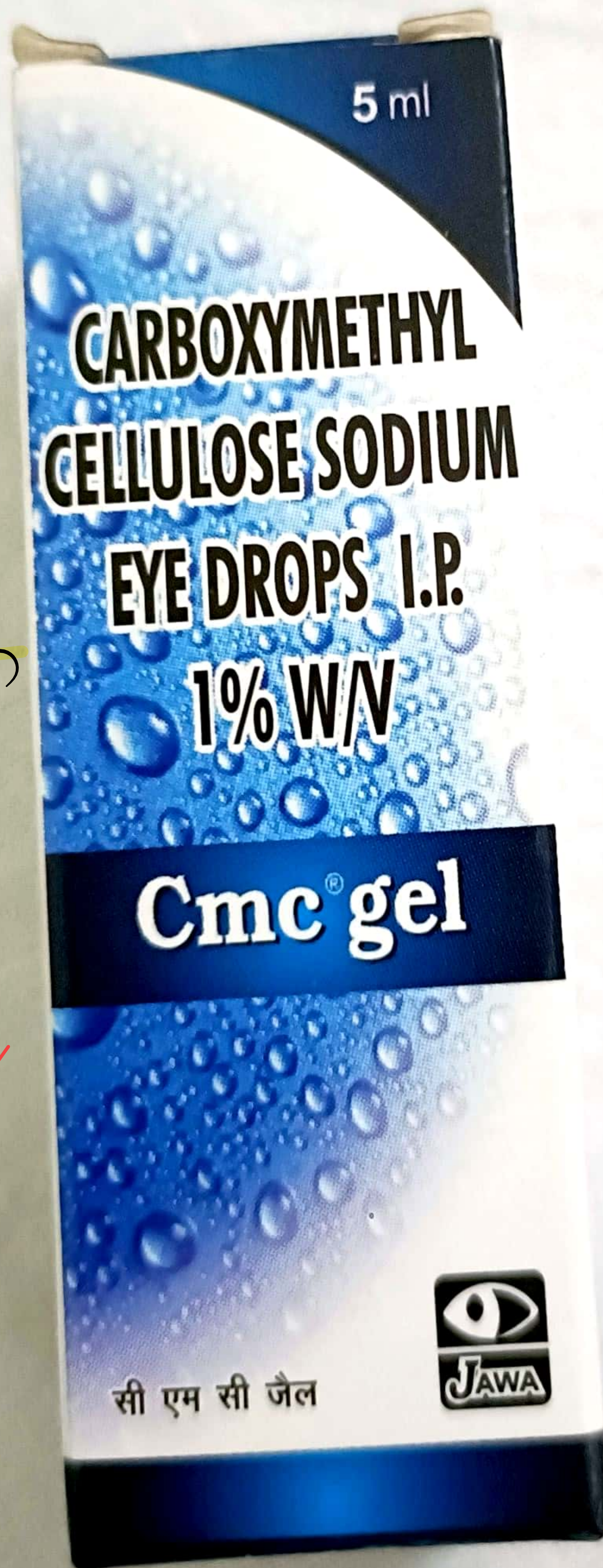
~~Dry~~

- Blurred vision

- Eye irritation

C/I:

Hypersensitivity ✓



1010

1 drop 3-6 times a day

Intralesional corticosteroid

— Uses → Uveitis
Allergic conjunctivitis

S/E, C/I → same as prednisolone.





SCHEDULE H PRESCRIPTION

CAUTION: Not to be sold by
retail without the prescription of a
Registered Medical Practitioner

Medicine: Keep out of reach
of children.

For full information see package

MSD
No. 28/8/92

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Pranaj Pharma Limited

Plot No. 67-70, Sector 2,

Phase II, Gurgaon, Haryana 122002

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MRP (incl. of all taxes)

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Rx

PREDNISOLONE

ACETATE

OPHTHALMIC

SUSPENSION USP

PRED FORTE[®]

STERILE

10 mL



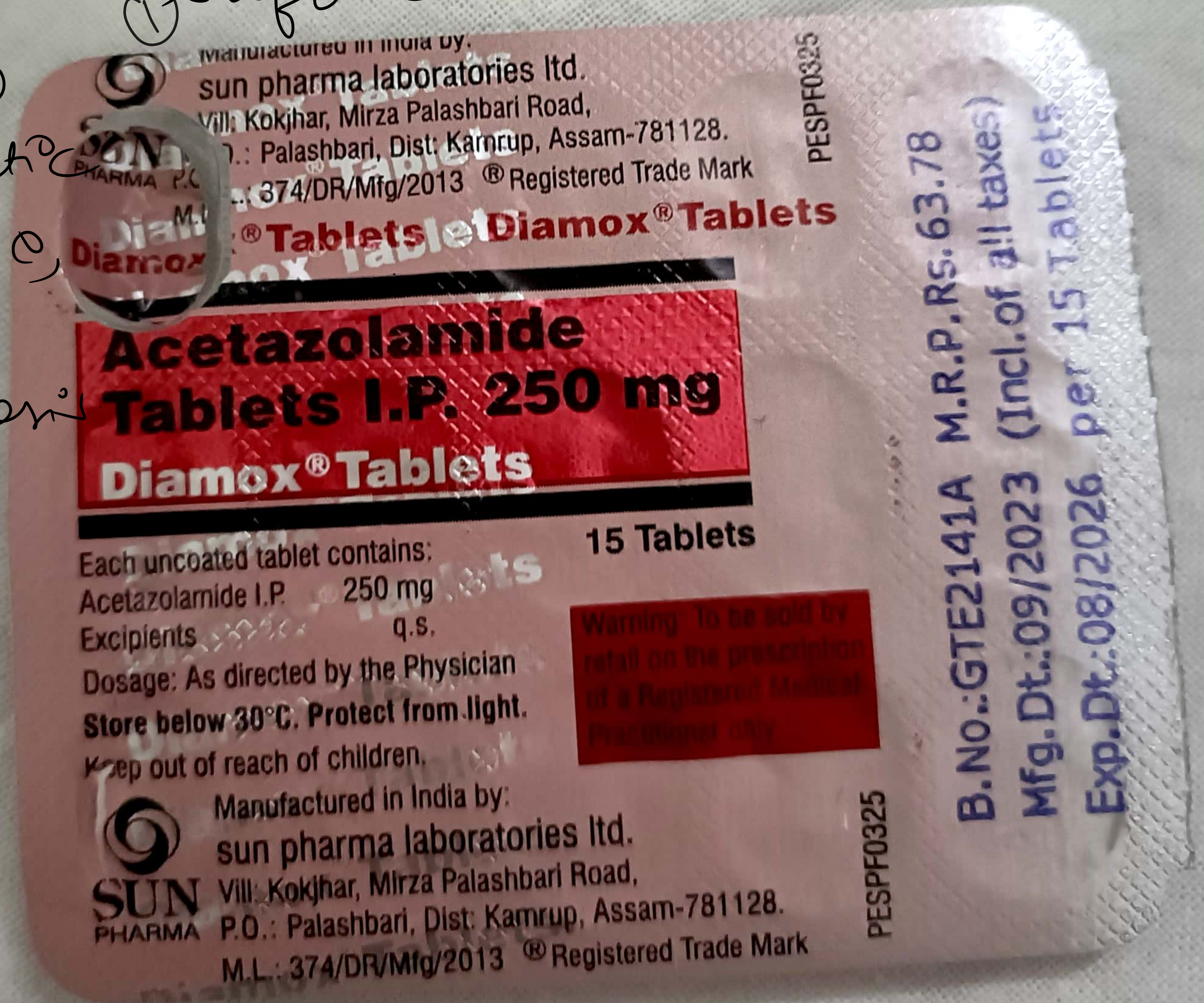
Carbonic anhydrase inhibitor
which $\downarrow$ IOP by $\downarrow$ aqueous humor
production

Uses: Primary open $\angle$ glaucoma
Chronic $\angle$ closure glaucoma
Pre op reduction in IOP

Side $\rightarrow$ ① Polyuria, ② fatigue, ③ Metallic
taste, ④ Met acidosis, ⑤ N&V

CI $\rightarrow$ ① Sulfonamide allergy,

② Renal
& hepatic
disease,
③ Met
acidosis



5

Antiviral

Uses → Herpes simplex keratitis HS → keratitis
herpes ~~blepharitis~~ conjunctivitis
Herpes zoster ophthalmicus HZ → ophthalmicus



S/E → mild burning, conjunctival irritation,
foreign body sensation

C/I → Hypersensitivity

— NSAID $\downarrow$ PG synthesis

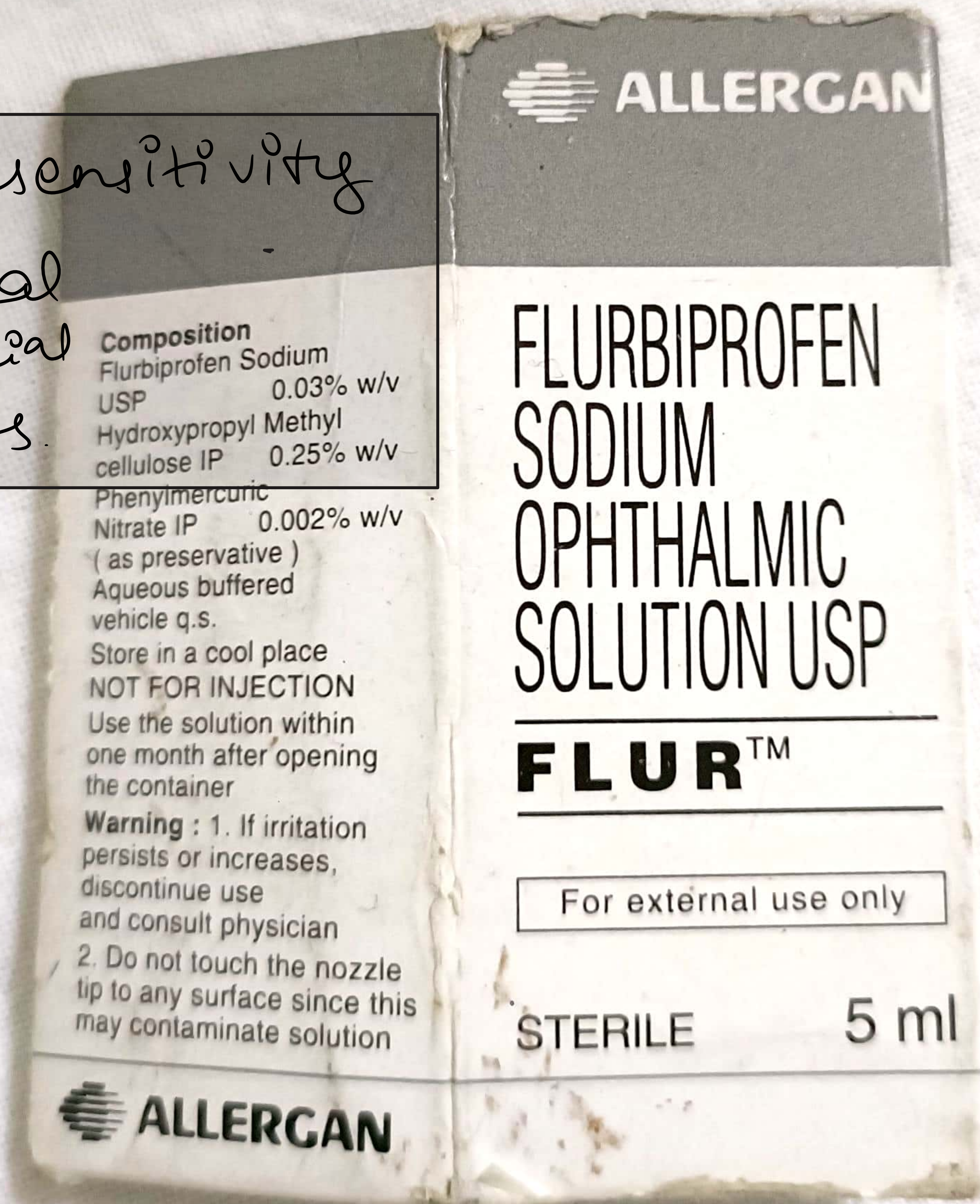
Uses $\rightarrow$ prevention of intra operative
myosis ✓

Post op inflammation & pain
relief ✓

S/E $\rightarrow$ Blurring, burning sensation,
conjunctival hyperaemia

C/I:

- Hypersensitivity
- Corneal
epithelial
defects



NSA IDS

5 ml

R_x

Bromfenac Ophthalmic
Solution 0.09% w/v

unibrom
Eye Drops

ajanta

unibrom
Eye Drops

Composition:
Each ml contains:
Bromfenac Sodium 1.035 mg
equivalent to
Bromfenac Free Acid 0.9 mg
Benzalkonium Chloride IP 0.005% w/v
(as preservative)
Sterile Aqueous Vehicle q.s.

Dosage: As directed by the Physician.

Store in a dry, well-ventilated place at
a temperature not exceeding 30°C.
Protect from light.

Directions: Use the solution within one
month after opening the container.
Bromfenac Ophthalmic solution should not be
administered while wearing contact lenses.

Warnings:

1. If irritation persists or increases,
discontinue the use and consult
the Physician.
2. Do not touch the nozzle tip to any
surface as this may contaminate
the solution.

FOR EXTERNAL USE ONLY.

NOT FOR INJECTION.

KEEP OUT OF THE REACH OF CHILDREN.

Warning: To be sold by retail on the
prescription of a Registered
Medical Practitioner only.



ML
2022
-22
-24
Y.SAM
TO
OLD

TROPICO PLUS

5 ml
PHENYLEPHRINE HCL
AND TROPICAMIDE
OPHTHALMIC
SOLUTION
EYE DROPS



Mfg. Lic. No. 430

Composition:

Phenylephrine HCL
Tropicamide

Tropicamide → Antimuscarinic (blocks M₃ receptors)
Phenylephrine → α agonist
→ causes mydriasis

Uses → fundus examination
→ pre op pupil dilatation
→ Breaking post synechiae

S/E:

- Dry eye
- Blurred vision
- Photophobia
- HTN
- palpitations

C/z:

- Angle closure
- glaucoma
- hypersensitivity
- CNS disorders.

Tropicamide And Phenylephrine

Ophthalmic Solution

PRATIK DALVI

426191 Age/Sex 13 Yr

IP-1 DL: 05/03/2021

Consultant: Dr. Shrikant Desai

→ Anticholinergic +
mydriatic

→ Decongestant +
mydriatic

Ofloxacin
(same as
moxifloxacin)



MEDICAL MANAGEMENT OF GLAUCOMA

I Prostaglandin Analogues



• MOA -

↑ uveoscleral outflow (main) by acting on FP receptors

↓

↑ Trabecular outflow.

- IOP lowering effect = 27-35% (from baseline)
- Preferred as 1st line agent (↓ systemic adverse effects than β blockers)
- Dosage : 0-0-1 (action lasts several days)
- Chance of interindividual receptor variation; change drug.
- Drugs:

i) Latanoprost (0.005%)

- 1st line $\therefore$ ↓ Ocular Adverse Effects
- 5-10% pts. show no response.



ii) Travoprost (0.004%)

- Fewer non responders
- Novel preservative : Polyquad



ii) Systemic

- Headache / Migraine
- Malaise
- Myalgia
- Skin rash

II Beta Blockers

• MOA:

- ↓ Aqueous production from ciliary epithelium by $\ominus$ CAMP.
- IOP lowering effect = 21-27%.
- Progressive lowering of effect with time, tachyphylaxis is seen in 10% pts.
- ↓ effect during sleep; $\therefore$ nocturnal aqueous production being half.
- Preferred as 1st line is:
- Unilateral Reaction to avoid cosmetic adverse effects / conjunctival hyperemia.
- Where PGAs are indicated:
 - Ocular inflammation
 - CME
 - Herpes simplex Keratitis (h/o)
- Dose : 1-0-1

• Adverse Effects:

i) Ocular

- Allergic conjunctivitis
- Punctate keratitis
- Granulomatous anterior uveitis.

ii) Systemic

- Bronchospasm
 - Fatal in asthma
 - Incidence : 1 in 50

- cardiovascular:

Heart block / Bradycardia / $\uparrow$ heart failure / hypotension.

- sleep disorders
- Alopecia

Contraindications:

- Asthma
- concurrent systemic β blocker use
- Bedtime use ($\downarrow$ BP $\rightarrow$ $\downarrow$ ONH perfusion $\rightarrow$ visual field disturbances)
- Peripheral vascular disease (Raynaud's phenomenon).

onset ; upto 18 months.

- granulomatous anterior uveitis.

ii) Systemic :

- Fatigue
- xerostomia (dryness of mouth)

Contraindications:

- In young children (<2yrs) it crosses BBB, so can cause:
 - CNS depression
 - Hypotension
- Vascular insufficiency
- with oral MAO inhibitors (-antidepressants) - can cause hypertension crisis.

Eg - Isocarboxazid, Phenelzine, Selegiline.

IV (A) Carbonic Anhydrase Inhibitors (Topical)

• MOA:

- ↓ Aqueous secretion
- Neuroprotective effect
- IOP lowering effect:
slightly less than β blockers (22%)



IV (a) Carbonic Anhydrase Inhibitors (systemic)

- used for short term management
∴ systemic side effects.

- can be used long term only if high risk of visual loss.

- Drugs:

i) Acetazolamide → Tab.
250 mg
(N) 1 SR

- Dosage:
250 - 1000 mg/day

Inj.
500 mg
powder

ii) Dichlorphenamide (Tab. 50mg)

- Dosage : 1-0-1 (or) 2-0-2
(or) 1-1-1 (or) 2-2-2

iii) Methazolamide (Tab. 50mg)

- Dosage : Same as Dichlorphenamide
- longer duration of action.

- Adverse Effects:

1) ocular - choroidal effusion detachment
post cataract symptoms → Angle closure.

2) Systemic - paraesthesia, malaise, hypokalaemia, ↓ mood,
Renal stones, Bone marrow supp., Aplastic anaemia.

ii) Carbachol

iii) Ecothiophate iodide.

• Adverse Effects:

i) Ocular

- Miosis
- Brow ache
- Myopic shift
- ↑ cataract c/f
- ↑ visual field defects.

ii) Systemic

- Bradycardia
- Confusion
- ↑ Urination

VI Osmotic Agents

• MOP:

Create an osmotic gradient

↓

Water is drawn from vitreous
(hypo-osmotic, lower conc. of solutes) to
Blood (hyperosmotic, higher conc.)

↓

↓ vitreous volume.

• Short term use

- Resistant acute ACG
- Pre op to ↓ IOP.

- Headache
- Backache
- Nausea
- Confusion

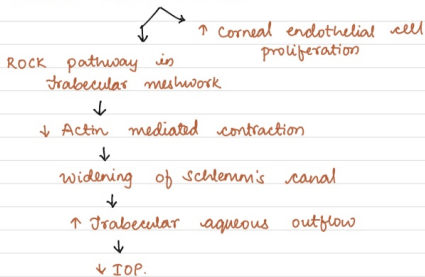
VII Rho Kinase Inhibitors

• MOA:

i) Ripasudil (0.4%)



• Selective ROCK1 Inhibitors



ii) Netasudil (0.02%)

• MOA:

- ROCK Inhibitor → ↑ Trabecular outflow

VIII Antimetabolites

	5-FU	MMC
• <u>MOA</u>	- Pyrimidine analogue ↓ ⊖ DNA synthesis ↓ ↓ Fibroblast Proliferation	- Antineoplastic antibiotic ↓ ⊖ DNA synthesis ↓ • ↓ Fibroblast proliferation • ↓ Vascular endothelial cells
• <u>Mode of administration</u>	- Intraoperative sponge 50 mg/ml for 5min (or) - Post op subconj. Inj. 5mg BD x 7d 5mg OD x 7d	- Intraoperative sponge 0.2mg/ml for 2min
• <u>uses</u>	- high risk Trab • Aphakia / pseudophakia • previous failed Trab • Young pt.	- High risk Trab • congenital glaucoma • Uveitic glaucoma • severe/refrac-tory glaucoma

- Steady IOP control for 6 months
- Intracorneal implant
 - Dose : 10 μ g.

5) Newer Drug delivery systems :

- Travoprost loaded punctal plugs
- Nanoparticle eye drops
- Drug patches ; transdermal over eyelid.

- Introduction
- Lens Induced Glaucoma

16. Neovascular Glaucoma (NVG)

17. Surgical Management of Glaucoma & Laser Management.

18. Ultrasound Biomicroscopy (UBM)

19. Glaucoma mnemonics.

iii) Bimatoprost (0.03%) / (0.01%)

- Prostanoid
- ↑ IOP lowering, but ↑ adverse effects
- Preservative free available



iv) Tafluprost

- ↓ IOP lowering, but ↓ adverse effects
- Preservative free available.

Adverse effects:-

i) Ocular

- Conjunctiva hyperemia (m/c)
- Eyelash
 - Lengthening
 - Thickening
 - ↑ No.
 - Hyperpigmentation
- Iris hyperpigmentation
 - occurs in 6 months
 - ∴ ↑ No. of stromal pigment granules.
- Periocular skin hyperpigmentation
- Periocular atrophy
- Pre op use → ↑ risk of CME
 - Pseudophakia
 - Aphakia
- Anterior uveitis
- Worsening of Herpetic Keratitis

• Drugs:-

i) Timolol Maleate $\left[\begin{array}{l} \text{Drops} - 0.25\% / 0.5\% \\ \text{Gel} - 0.1\% / 0.25\% / 0.5\% \end{array} \right]$

- Dosage : 1-0-1.

ii) Betaxolol (0.25% / 0.5%)

- Dosage : 1-0-1

- ↓ Hypertensive adverse effects

- ↓ Bronchoconstriction

- ↑ ONH blood flow ($\because$ CCB effect)

iii) Levobunolol (0.5%)

- Dosage : 1-0-0 / 1-0-1

iv) Carteolol (1% / 2%)

- Dosage : 1-0-1

- ↓ Systemic adverse effects.

v) Metipranolol (0.3%)

- Dosage : 1-0-1

- ↑ Granulomatous anterior uveitis.

III Alpha 2 Agonists:

- MOA:

- $\downarrow$ Aqueous synthesis from ciliary epithelium.
- $\uparrow$ Uveoscleral outflow
- Neuroprotective effect

- Drugs:

- i) Brimonidine (0.2%)



- Dosage : 1-0-1
 - IOP lowering effect slightly less than timolol (as %)
 - Novel preservative : Puncte

- ii) Apraclonidine (0.5% / 1%)

- Not suited for long term use $\therefore$ loss of therapeutic effect, so used for temporary measure in:



- Post AS case - IOP control
 - Pre-glaucoma.

- Adverse Effects:

- i) Ocular:

- Allergic conjunctivitis - can be delayed

- Dosage $\begin{cases} 1-0-1 & \text{if Adjunctive Rx.} \\ 1-1-1 & \text{if Monotherapy.} \end{cases}$

• Suspensions; may leave white residue (Brinzolamide only)

• Drugs:

i) Boszolanide (2.1.)

- Adverse Effects
 - Stinging
 - Transient bitter taste
 - Bone marrow suppression

ii) Brinzolanide (1.1.)

- Suspension
- less adverse effects.

• Contraindications:

- Corneal endothelial dysfunction; precipitate corneal decomposition.
- Sulfonamide antibiotic allergy; can cause cross reaction
(No additive effect if systemic & topical started together)

Eg: Sulfadiazine, Furosemide.

II Miotics (Cholinergic Agonists)



• MOA:

- Contraction of sphincter pupillae

↓

Pulls peripheral iris away from
TM

↓

Open the angle of AC.

- Contraction of ciliary muscle

↓

↑ Aqueous outflow through TM
i.e., ↑ Trabecular outflow.

• Uses:

- Presbyopia
- Angle closure glaucoma
- Pseudophakic / Aphakic glaucoma

• Drugs:

- i) Pilocarpine (0.5% / 1% / 2% / 4%)
↳ gel also available

- Dosage
 - 0-0-1 (gel)
 - 1-0-1 (post laser iridotomy)
 - 1-1-1 (solution, for PACG)

- IOP lowering effect: same as timolol.

- Drugs:

- i) Mannitol (20% soln)

- Dosage : 1 gm/kg or 5 ml/kg
I.V over 30-60 min.

- Peak effect after 30 min

- Monitor - OP, Creat., Electrolytes



- ii) Glycerol (50% soln)

- Dosage : 1 gm/kg (or) 2 ml/kg
oral with lemon juice

- Sweet taste

- Peak effect : after 1 hr.

- H&T monitoring in Diabetes mellitus patients.

- iii) Isosorbide (45% soln)

- Dosage: Same as glycerol, Tab.

- minty taste

- Metabolically inert safe in Diabetes mellitus patients.

- Adverse effects (systemic)

- Cardiovascular overload (caution in Heart/renal diseases)

- Urinary retention

- NET Inhibitor

- ↓ Aqueous humor production

- ↓ Episcleral venous pressure

- Dosage : - Ripasudil 1-0-1

- Netasudil 0-0-1

- Adverse effects

- Conjunctivitis hyperemia

- ICH

- Cornea verticillata

- Drug Interactions

- show additive effect with :

- PE analogues

- β blockers

- No additive effect with :

- Pilocarpine

- Uses :

- POAG

- Steroid induced glaucoma

- Fuch's endothelial dystrophy

- Diabetic Retinopathy (Experimental;

- ↑ blood flow to ONH).

• A/E:

- corneal Epi defects
- late bleb leak
- wound leak

- Corneal endothelial damage
- overfilling bleb
- AC reaction
- Hypotony maculopathy (most dreaded)

→ Recent Advances in Glaucoma Drugs:

1) ROCK Inhibitors

2) Antimetabolites

3) Nitric oxide donating PG analogues

- Drug : Latanoprostene Bunol
- Commercial name : Vyculta

• MOA :

- NO relaxes trabecular meshwork

↓

↑ Trabecular (conventional) outflow

- ↑ Uveoscleral outflow (∴ PG analogues)

• Dosage : 0-0-1.

4) PG analogue implant

• Drug : Bimatoprost

- commercial name : Durysta