

Chapter 10

EYE

- 10.1 Administration of drugs to the eye and control of microbial contamination *p. 392*
- 10.2 Anti-infective eye preparations *p. 395*
 - 10.2.1 Antimicrobials *p. 395*
 - 10.2.2 Antifungals *p. 401*
 - 10.2.3 Antivirals *p. 403*
- 10.3 Corticosteroids, other anti-inflammatory preparations and antihistamines *p. 403*
- 10.4 Mydriatics, cycloplegics and treatment of glaucoma *p. 409*
 - 10.4.1 Mydriatics *p.409*
 - 10.4.2 Cycloplegics *p.409*
 - 10.4.3 Drugs for glaucoma *p.411*
- 10.5 Local anaesthetics *p.416*
- 10.6 Miscellaneous ophthalmic preparations *p.417*
 - 10.6.1 Tear deficiency, ocular lubricants, and astringents *p.417*
 - 10.6.2 Diagnostic and perioperative preparations *p.419*
- 10.7 Contact lenses *p. 420*

10.1 ADMINISTRATION OF DRUGS TO THE EYE AND CONTROL OF MICROBIAL CONTAMINATION

Prerequisites of successful therapy in ophthalmology:

1. **Correct application:** Good technique usually requires active participation by the patient. The instruction and initial supervision by ophthalmologist or qualified assistant is needed.
2. **Proper frequency:** i.e. the medications should be given at correct times, which might vary from once in a day to every 1-15 minutes.
3. **Sufficient quantity:** One drop is all that is needed though typically less than 5% of the dose given in an eye drop is absorbed intraocularly.
4. **Compliance:** The practical realization of the prescribed medication depends on the reliability of the patient.
5. **Systemic effects from topical application :** Undesirable effects may well arise from absorption of drugs into the general circulation via conjunctival vessels or from the nasal mucosa after the excess of the preparation has drained down through the tear ducts; nasal drainage of drugs is much more often associated with eye drops than with eye ointments. For example, a beta blocker administered as eye drops may induce bronchospasm or bradycardia in susceptible individuals. Although the extent of systemic absorption following ocular administration is highly variable.
6. **Miscellaneous :** Other factors that should be kept in mind : Eye drops must be kept sterile (container tip should not touch the eye), proper storage (protection from high temperature, humidity and light) must be ensured, attention to shaking suspensions and expiration date must be noticed.

ROUTES OF ADMINISTRATION

LOCAL

a) **Topical** : This route should always be considered before resorting to the systemic route. Frequent application is almost equivalent to subconjunctival injections.

i) **Eye Drops**- Method of instillation: Eye drops are generally instilled into the pocket formed by gently pulling down the lower eyelid; one drop is all that is needed.

- When administered in the form of eye drops, drugs penetrate the globe, probably through the cornea.
- Runoff can be reduced and contact time prolonged, if it is instilled into the lower fornix after gently pulling the lower lid away from the globe.
- Undesirable systemic side effect (by beta blocker) can be reduced by keeping both eyes closed for 1-3 minutes after instillation of a drop and also by pressing on the area of the lacrimal sac for a few minutes.
- When two different preparations in the form of eye drops are required at the same time in a day, for example **pilocarpine** and **timolol** in glaucoma, dilution and overflow may occur when one immediately follows the other. **The patient should therefore leave an interval of at least 5 minutes.**
- Generally it is inadvisable for patients to continue to wear contact lenses, particularly hydrophilic (soft) contact lenses when receiving eye drops.

ii) **Ointments**- An eye ointment is generally applied by squeezing a small amount (about 1 cm) of ointment into the pocket formed by gently pulling down the lower eyelid; the ointment melts rapidly and blinking helps to spread it. Ointments with Vaseline base are not suitable for daytime use as it blurs vision that with Vaseline base

is less problematic than with paraffin base.

b) **Anterior peri-ocular injections**
i) **Subconjunctival injections**

- In this route the drug diffuses through the cornea and sclera to the anterior and posterior chambers and vitreous in higher concentration.
- Because the dose-volume is limited (**usually not more than 1 ml**), this route is suitable only for drugs, which are readily soluble.
- Useful for non-compliant patients needing high concentration of antibiotic or steroids. Also used for giving mydriatics.
- Injection is painful and if not carefully given conjunctiva tends to become scarred.
- When given at the end of surgery care should be taken to avoid retrograde leak into the eye.

ii) **Sub-Tenon Injections**

- More effective than sub-conjunctival injection.
- Technically difficult, chances of perforation more if adequate care is not taken.
- Less retrograde needle tract reflux than sub-conjunctival injection.

c) **Posterior Perocular (Peribulbar or Retrobulbar) Injection:**

- Technically difficult and more risk of perforation than the previous ones.
- Usually used to give depot steroid (to have prolonged effect achievable in vitreous, choroids, optic nerve with risk of elevation of high intraocular pressure in steroid responder) and to give block before different ocular operations.

d) **Intracameral Injection**

Usually given to constrict the pupil near the end of cataract surgery.

e) **Intravitreal Injection**

10. EYE

- Mainly indicated for endophthalmitis
- Must be given by an expert inside the operation theatre (OT).
- Exact calculation of the dose and the amount to be injected must be strictly calculated.
- Updated knowledge of the retinal toxicity of the drugs should be kept in mind.
- f) Ocuser: These are suitable plastic devices that gradually release a specified amount of drug over a period. It is not available in our country.

SYSTEMIC DRUGS

Infections of the eye not controllable by local medications need systemic drugs. Infections involving deep structures that can not be reached by local applications, and those that pose a danger of systemic spread, require therapy via bloodstream e.g. dacryocystitis, orbital cellulitis and metastatic endophthalmitis. Gonococcal infections always should be treated systemically to forestall generalized spread. The same applies to *Pseudomonas*, *Haemophilus* and *Chlamydia* infections in children.

Use of steroids in the systemic route is indicated particularly in cases where ocular disease is a part of general systemic condition or where the eye is the target of a systemic response, e.g. in orbital pseudotumor, Graves' orbitopathy, giant cell arteritis, rejection of grafted tissue and in certain type of posterior panuveitis such as Harada's disease, sympathetic ophthalmia, Behcet's disease and sarcoidosis. For rapid control of intraocular pressure (IOP) in glaucoma, systemic route is a must.

Most of the needed cytotoxic drugs in neoplastic disorders of the eye are given by systemic routes.

Systemic form can be given by oral or intravenous routes

MICROBIAL INFECTION

Steps needed to control microbial contamination:

- Strict sterility of the preparations for the eye should be ensured. Care should be taken to avoid contamination of the contents of the eye drops during use.
- Eye drops in multiple-application containers for **domiciliary** use should not be used for more than 4 weeks after first opening.
- Rules for use of eye drops in hospitals - Eye drops for uses in hospital wards are normally discarded one week after first opening. Separate containers should be provided for each patient. Containers used before an operation should be discarded at the time of the operation and fresh containers to be supplied. A fresh supply should also be provided upon discharge from hospital.
- Eye drops used in out-patient departments should be discarded at the end of each day. In clinics for eye diseases (e.g., cornea clinic) and in accident and emergency departments, where the dangers of infection are high, single-application packs should be used: if a multiple-application pack is used, it should be discarded after single use.
- Diagnostic dyes (e.g. fluorescein) should be used only from single application packs or from strips as chances of fungal contamination is very high in our country.
- In eye surgery it is wise to use single-application containers. Preparations used during intra-ocular procedures and others that may penetrate into the anterior chamber must be isotonic and without preservatives and buffered if necessary to a neutral pH. Large volume intravenous preparations are not suitable for this purpose. For all surgical procedures, a

previously unopened container is used for each patient.

10.2 ANTI-INFECTIVE EYE PREPARATIONS

Treatment by topical applications is sufficient for most acute superficial eye infections. Blepharitis and conjunctivitis are often caused by *staphylococci*; *keratitis* and endophthalmitis or other eye infections may be bacterial, viral, fungal even protozoal (e.g. acanthamebia, crab lice etc).

BACTERIAL BLEPHARITIS is treated by application of antibacterial eye ointment to the lid margins and to the conjunctival sac to prevent spread of infection there. Systemic treatment may occasionally be needed. It is usually given after culture of organisms from lid margin and determining their antibiotic sensitivity. Antibiotic such as tetracycline given for 3 months or longer may be appropriate. But above all maintenance of lid hygiene is the most important step to improve the condition.

Acute infective conjunctivitis is treated with antibacterial eye drops and ointment. Initial treatment should not be started with a sophisticated, newly discovered broad-spectrum anti-infectives, which should be kept reserved for unresponsive resistant cases. A poor response might indicate viral or allergic conjunctivitis. Gonococcal conjunctivitis is treated with systemic and topical antibiotics.

Corneal ulcer and keratitis require specialist treatment in specialized clinics where facilities of taking swabs and scrapping for gram staining, Potassium Hydroxide preparations and culture is available. All the facilities are needed for prompt, precise and accurate diagnosis of the cause of the disorder. Prompt accurate diagnosis and management save million eyes from blindness. Treatment options include specific, broad spectrum or fortified topical antibiotics, subconjunctival or systemic administration of antibiotics.

Endophthalmitis is a medical emergency, which also calls for specialist management and often requires parenteral, subconjunctival, or intravitreal administration of antibiotics.

ANTIBACTERIAL AGENTS

Bacterial infections are generally treated topically with eye drops and eye ointments. Systemic administration is sometimes appropriate in blepharitis. Other than topical, a variety of routes (intra-cameral, intravitreal and systemic) may be used in intra-ocular infection.

USE IN MIXTURE WITH CORTICOSTEROIDS. Many antibiotic preparations also incorporate a corticosteroid. For symptomatic relief and when accurate diagnosis can not be made such mixtures should not be used. In particular they should not be prescribed for undiagnosed 'red eye', which is sometimes caused by the herpes simplex virus and may be difficult to diagnose. These preparations can be used postoperatively after intraocular surgery.

ADMINISTRATION

Eye drops: Instillation varies according to the severity of infection. It varies from every minute to 2- 3 times a day. Some preparation needs very infrequent instillation to exert antibacterial effect in the maintenance therapy e.g. twice daily with lomefloxacin and fusidic acid.

Eye ointment: Apply either at night (if eye drops used during the daytime) or 3- 4 times daily (if eye ointment used alone).

10.2.1 ANTIMICROBIALS (see section 1.1)

AZITHROMYCIN DIHYDRATE

Indications: trachomatous conjunctivitis caused by *Chlamydia trachomatis* and purulent bacterial conjunctivitis.

10. EYE

Side-effects: ocular discomfort (including pruritus, burning), blurred vision; less commonly eyelid eczema, eyelid erythema, eyelid oedema, conjunctival hyperaemia, keratitis

Dose: Apply twice daily for 3 days; review if no improvement after 3 days

Proprietary Preparations

Azithromycin 1%

AZ (*Aristo*), Eye drops, Tk. 120.00/2.5ml

Azicin (*Opsonin*), Eye Drops, Tk. 90.23/2.5 ml

Odazyth (*ACI*), Eye drops, Tk. 110.41/2.5 ml

Zibac (*Popular*), Eye drops s, Tk. 110.41/2.5ml

Zimax (*Square*), Eye drops, Tk. 110.00/5 ml

Zita (*Kemiko*), Eye drops, Tk. 120.00/2.5 ml

CHLORAMPHENICOL ^[ED]

Indications: superficial ocular infections as it has the broadest spectrum and lowest propensity for generating resistance in organisms (see also section 1.1.12)

Cautions: blood dyscrasia secondary to bone marrow hypoplasia can occur

Side-effects: hypersensitivity, transient stinging, bitter taste in mouth

Dose: see in section 10.2

Note: Should not be used in patient with severe blood dyscrasia, family history of bone marrow depression, new born. Not recommended for prolonged use.

Proprietary Preparations

Chloramphenicol drop 0.5% & ointment 1%

Chlorphen (*Nipa*) Eye drops, Tk. 30/10ml

Chemophenicol (*Chemist*), Eye Drops, 0.5%, Tk. 34.00/10 ml

I-guard (*Incepta*), Eye/Ear drops, Tk. 34.40/10ml

Optaphenicol (*Reman*) Eye drops, Tk. 34/10ml; Oint. Tk. 10.00/3gm

Ophacol (*Drug Int.*), Eye / Ear drops Tk. 30.00/10 ml

Optichlor (*Jayson*), Eye drops, Tk. 20.23/10 ml; Oint., Tk. 12.04/5 gm

Opticol (*Asiatic*), Eye Oint., Tk. 8.34/3 gm ; drops, Tk. 34.39/10 ml

Ramphen (*Kemiko*), Eye/Ear drops, Tk. 34.27/10 ml

SQ-Mycetin (*Square*), Eye/Ear drops, Tk. 34.40/10 ml

Dexamethasone 0.1%+ Chloramphenicol 0.5%

A-Phenicol-D (*Acme*), Eye drops, Tk. 70/5ml

Chlormet (*Beximco*), Eye drops, Tk. 60/5ml

Cloradex (*Navana*), Eye drops, Tk. 70/5 ml

Cloram-D (*Ibn Sina*), Eye drops, Tk. 70/5ml

Cloraodex (*Nipa*), Eye drops, Tk. 70/5 ml

Decalor (*Jayson*), Eye drops, Tk. 50.20/5 ml

Denicol (*ACI*), Eye drops, Tk. 65.25/5 ml

Dexacol (*Opso Saline*), Eye drops, Tk.

52.63/5ml

Dexagen C (*Genera*), Eye drop, Tk. 70/5 ml

Dexaguard (*Incepta*), Eye drops, Tk. 70/5 ml

Dexonex-C (*Square*), Eye/Ear drops Tk. 70/5ml

Dextor C (*Eskayef*), Eye drops, Tk. 70/5 ml

Nicodex (*Rephco*), Eye drops, Tk. 60/5 ml

Ocubac-D (*Apex*), Eye drops, Tk. 60/5 ml

Opticol-D (*Asiatic*), Eye drops, Tk. 70/5 ml

Optidexn (*Reman*) Eye drops, Tk. 70.26/5 ml

Orbidex C (*Popular*), Eye drops, Tk. 70/5 ml

Ramdex (*Kemiko*), Eye drops, Tk. 70/5 ml

Sonexa-C (*Aristo*), Eye drops, Tk. 70/5 ml

Stenicol (*Drug Int.*), Eye drops, Tk. 60/5 ml

AMINOGLYCOSIDES

(see also section 1.1.4)

These antibiotics may cause irreversible, partial or total deafness when given systemically or when applied topically to open wounds or damaged skin. This effect is dose related and is enhanced by renal or hepatic impairment. Although this effect has not been reported following topical ocular use, the possibility should be considered when high dose topical treatment is given to small children or infants. These group of drugs are nephrotoxic and ototoxic.

AMIKACIN

Many strains of gram negative organisms resistant to gentamicin and tobramycin have shown to be sensitive to amikacin *in vitro*.

Indications: this formulation for intravitreal injection is rarely used now for retinal toxicity

Dose : 0.4 mg in 0.1ml

Proprietary Preparation

(see section 1.1.4)

GENTAMICIN ^[ED]

Indications: effective against many gram negative organisms (Specially *Pseudomonas aeruginosa*) and *Staphylococci* (see also section 1.1.3).

Topical preparation can be strengthened to 2% to have effective concentration in anterior chamber

Cautions : patient with renal toxicity. It should not be introduced intraocularly as it can cause corneal endothelial damage if injected in anterior chamber and retinal infarction if injected intravitreally. Prolonged use may develop resistance and chances of super infection. It may retard corneal wound healing

Dose : see in section 10.2

Proprietary Preparations

Gentamicin 0.3%.

Genacyn (*Square*), Eye/Ear drops, Tk. 32.02/10 ml

Gentacin (*Acme*), Eye Oint., Tk. 9.75/3.5 gm

Gentin (*Opso Saline*), Eye Oint. Tk. 6.79/3 gm; Eye drops, Tk. 23.59/10 ml

G-Gentamicin (*Gonoshasthaya*), Eye/Ear drops, Tk. 25.00/10 ml

Gisin (*Nipa*), Eye/Ear,drops 30.36/10ml

Igen (*ACI*), Eye drops, Tk. 32.02/10 ml

Recin(*Reman*) Eye drops,Tk. 35.00/10ml

NEOMYCIN

Powerful bactericidal antibiotic. It is added to many antimicrobials, antibacterial and steroid preparations

Indications : acanthamoeba keratitis

Side-effects : it has the propensity to induce allergy

Dose : see section 10.2

Proprietary Preparations

Polymix (*Opso Saline*), Eye Oint. , Neomycin Sulphate 500 IU + Bacitracin Zinc 1 Lac IU/gm, Tk. 26.41/3 gm

TOBRAMYCIN

Same spectrum as that of gentamicin but the effect on pseudomonas is even better.

Proprietary Preparations

Tobramycin 0.3%

Cinarex (*Beximco*), Eye drops, Tk. 90/5 ml

Gentob (*General*), Eye Oint.,Tk. 60/3 gm;

Intobac (*Incepta*), Eye drops, Tk. 85/5 ml

Tk. 22.64/3 gm; Eye drops, Tk. 67.67/5 ml

T-Mycin (*Aristo*), Eye drops, Tk. 90/5 ml ;

Eye Oint., Tk. 60/3 gm

Tobi (*Asiatic*), Eye drops, Tk. 80/5 ml

Tobrabac(*Popular*), Eye drops,Tk.85.32/5ml

Tobracin (*Opso Saline*), Eye Oint,Tk. 22.64/3

gm; Eye drops, Tk. 67.67/5 ml

Tobracin (*Opso Saline*),Eye oint.,

Tobramin (*Nipa*), Eye drops, Tk. 90/5 ml

Tobrel(*Healthcare*), Eye drops,Tk. 100/5 ml

Tomycin (*Ibn Sina*), Eye Oint.,Tk. 55/3 gm;

Eye drops, Tk. 90/5 ml

Torcin (*Opsonin*), Eye drops,Tk. 67.67/5 ml

Tobramycin ., 0.3% + Dexamethasone0.1%.

Cinarex D(*Beximco*), Eye drops,Tk.150/5 ml

Dextrobac(*Incepta*), Eye drops,Tk. 150/5 ml

Eyetex (*Nipa*), Eye drops,Tk. 150.00/5 m

Oint., Tk. 90.00/3gm

Steron-T(*Acme*), Eye drops, Tk. 130.00/5 ml

T-dex(*Reman*) Eye/Ear drops,Tk. 150/5 ml; Eye

Oint.,Tk.90.00/3hm

Texa (*Drug Int*), Eye drops, Tk. 125.00/5 ml

T-Mycin plus (*Aristo*), Eye Oint., Tk.

90.00/3.5 gm; Eye dropTk. 150.00/5 ml

Tobicort (*Asiatic*), Eye drops, Tk. 150/5 ml

Tomycin-D (*Ibn Sina*), Eye drops, Tk.150/5

ml; Tk. 90/3.5 ml

FLUOROQUINOLONES

Broad-spectrum bactericidal antibiotic effective against *Staphylococci*, *Pseudomonas*, *Brucella*, *Haemophilus*, *Moraxella*, *N. gonorrhoea*, *Klebsiella*, but less effective against *Streptococci* and *Pneumococci*.

They produce effective and long lasting concentration in tears. (see also section 1.1.7)

BESIFLOXACIN

Indications: conjunctivitis caused by susceptible strains of CDC coryneform group G, *Corynebacterium pseudodiphtheriticum*, *C. striatum*, *Haemophilus influenzae*, *Moraxella lacunata*, *Staphylococcus aureus*, *S. epidermidis*, *S. hominis*, *S. lugdunensis*, *Streptococcus mitis* group, *S. oralis*, *S. pneumoniae*, or *S. salivarius*.

Side-effects: redness, blurred vision, pain, irritation, pruritus and headache

10. EYE

Dosage: one drop in the affected eye(s) 3 times a day, four to twelve hours apart For 7 days.

Proprietary Preparations

Besifloxacin 0.6%

Besiflox (*Aristo*), Eye drops, Tk. 350/5 ml

Besigen (*General*), Eye drops, Tk. 350/5 ml

Besiven (*Incepta*), Eye drops, 0.6%, Tk. 350/5ml

Besibac (*Popular*), Eye drops, 0.6%, Tk. 350.00/5 ml

CIPROFLOXACIN^[ED]

Indications: corneal ulcer, used for pre and post-operative prophylaxis in intraocular surgery. It is especially useful to combat methicillin resistant *Staphylococci*, *Pseudomonas*, and *Gonococci*

Cautions : CHILD under 1 year of age

Side-effects : local burning sensation, discomfort, foreign body sensation, conjunctival hyperemia white crystalline precipitate

Dose : see section 10.2.

Intensive application (especially in the first 2 days) is required throughout the day and night for severe infection.

Proprietary Preparations

Ciprofloxacin 0.3%

Aprocin (*Aristo*), Eye drops , 10ml, Tk. 50.00/10 ml ;Eye Oint., Tk. 32.00/3 gm

Bactin (*Ibn Sina*), Eye drops, Tk. 35.14/5 ml ; Tk. 50.00/10 ml ; Eye Oint., Tk. 35.00/3 gm

Beuflox (*Incepta*), Eye drops, Tk. 40/5 ml

Ciflox (*Reman*) Eye/Ear drops, Tk. 35/5ml; Tk. 50/10ml; EyeOint., Tk. 35/3gm

Cip (*Asiatic*), Eye /Ear drops, Tk. 40/10 ml; Eye Oint., Tk. 32.00/3 gm

Ciprin (*Nipa*)Eyedrops, Tk. 40/5ml; Tk. 50/10ml ; EyeOint., Tk. 35/3gm

Cipro-A (*Acme*), Eye drops, Tk. 40.00/5 ml

Cipro-C (*Chemist*), Eye drops, Tk. 38/5 ml; Powder for Susp., 60 ml, Tk. 100.00/60 ml; 500 mg, Tk. 6.70/Tab.

Ciprocin (*Square*), Eye/ Ear drops, Tk. 40.15/5 ml

Ciprox (*Opsonin*), Eye /Ear drops, Tk. 35.13/5 ml; Oint Tk. 20.08/3g

Ciproxy (*Opso Saline*), Eye /Ear drops, Tk. 26.41/10 ml; Eye Oint., Tk. 15.10/3 gm

Ciprozid (*Drug Int.*), Eye drops, Tk. 40/10 ml

Civox (*Popular*) , Eye drops Tk. 35.13/5 ml

Dexaflox (*General*), Eye drops Tk. 75/5 ml

Floxabid ED (*ACI*), Eye drops, Tk. 40/5 ml

Floxacin (*Navana*), Eye drops, Tk. 50/10 ml

G-Cipro (*Gonoshasthaya*), Eye drops, Tk. 15.00/10 ml

Lox Eye (*Apex*), Eye drops, Tk. 35.00/5 ml

Neofloxin (*Beximco*), Eye/ Ear drops, Tk. 40.00/5 ml

Procin (*Kemiko*), Eye/ Ear drops Tk. 50/10 ml

Rocipro (*Healthcare*), Eye drops, Tk. 45/5 ml

Spectra (*Jayson*), Eye/Ear drops, Tk. 40/5 ml

Ciprofloxacin 0.3% + Dexamethasone 0.1%

Aprodex (*Aristo*), Eye/Ear drops, Tk. 75/5 ml

Bactin-D (*Ibn Sina*), Eye/Ear drops, Tk. 75.28/5 ml

Beuflox-D (*Incepta*), Eye drops, Tk. 75/5 ml

Ciflodex (*Reman*) Eye drops, Tk. 75.00/5ml

Cip-D (*Asiatic*), Eye/Ear drops, Tk. 75/5 ml

Cipro-D (*Acme*), Eye drops, Tk. 75.00/5 ml

Ciprozid-DX (*Drug Int.*), Eye/Ear drops, Tk. 75.00/5 ml

Civodex (*Popular*), Eye drops, Tk. 75.28/5 ml

Neofloxin D (*Beximco*), Eye drop, Tk. 75/5 ml

Opdex (*Nipa*), Eye drops, Tk. 75.00/5 ml

Procin-D (*Kemiko*), Eye/Ear drops, Tk. 75.00/5 ml

GATIFLOXACIN

Indications: bacterial infections (e.g. Bacterial conjunctivitis, Blepharitis and Blepharo-conjunctivitis) caused by susceptible strains of the following organisms: Aerobic Gram-Positive Bacteria, *Corynebacterium propinquum*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus pneumonia*, Aerobic Gram-Negative Bacteria *Haemophilus influenza*.

Cautions: pregnancy & Breast-feeding.

Side-effects: bad taste in the mouth, blurred vision, eye discharge, headache, irritation, pain, dryness, or redness of the eyes, itchy eyes, tearing and watery eyes.

Dose: days 1 and 2; 1 drop into the affected eye(s) every 2 hours while awake, up to 8 times daily. Days 3 to 7 days; 1 drop up to 4 times daily while awake.

Proprietary Preparations

Gatifloxacin 0.3%

Gatibac (*Popular*), Eye drops, Tk. 100/5 ml

Gatiflox (*Incepta*), Eye drops, Tk. 100/5 ml; 0.5%, Tk. 125/5 ml

Gatigen (*General*), Eye drops, Tk. 100/5 ml

TAG (*Aristo*), Eye drops, Tk. 100/5 ml

Tget (*Opsonin*), Eye drops, Tk. 75.19/5 ml

Xegal (*Beximco*), Eye drops, Tk. 90/5ml

Gatifloxacin 0.3% +Dexamethasone 0.1%.
Dexagen G (General), Eye drops, Tk.120/5ml
Gatidex (Opso Saline), Eye drops,
 Tk.90.23/5ml
Gatson (Aristo), Eye drops, Tk. 120/5 ml
Orbidex G (Popular), Eye drops, Tk. 120/5ml

LEVOFLOXACIN

Indications: postoperative ocular infection and bacterial conjunctivitis; endophthalmitis

Contraindication: hypersensitivity to levofloxacin

Side-effects: transient decreased vision, fever, foreign body sensation, headache, ocular pain, discomfort, photophobia

Dose: day 1&2: 1-2 drops in the affected eye(s) every 2 hours while awake up to 8 times /day

Day 3 to 7: 1-2 drops in the affected eye(s) every 2 hours while awake up to 4 times per day

Proprietary Preparations

Evo (Beximco), Eye drops, 0.5%, Tk. 80/5 ml; 1.5%, Tk. 130.00/5 ml

Leflox (ACI), Eye drops, 0.50%, Tk. 80.30/5ml; 1.50%, Tk. 120.00/5 ml

Leo (Acme), Eye drops, 0.5%, Tk. 80.30/5ml

Lequin (Apex), Eye drops, 0.5% Tk. 80/5 ml

Levobac (Popular), Eye drops, 0.5%, Tk. 90/5 ml; 1.5%, Tk. 130/5 ml

Levoflox (Drug Int), Eye drop, 0.5%, Tk.80/5ml

Levogen (General), Eye drops, 0.5%, Tk. 90/5 ml; 1.5%, Tk. 130.00/5 ml

Levomax (Eskayef) Eye drops, 0.5%, Tk.90/5ml

Levoquin (Navana), Eye drops, 0.5%, Tk. 90.00/5 ml

Levosina (Ibn Sina), Eye drops, 0.5%, Tk. 90.00/5 ml

Levox (Opsonin), Eye drops, 0.5%, Tk. 67.67/5 ml; 1.5%, Tk. 97.74/5 ml

Levoxin (Incepta), Eye drops, 0.5%, Tk. 90.00/5 ml; 1.5%, Tk. 130.00/5 ml

Lin (Kemiko), Eye drops, 0.5%, Tk. 90/5 ml

Lovicin (Nipa), Eye drops, 0.5%, Tk.90/5ml

Ovel (Aristo), Eye drops, 0.5%, Tk. 90.00/5 ml; 1.5%, Tk. 120.00/5 ml

Resquin (Healthcare), Eye drops, 0.5%, Tk. 90.00/5 ml

Revacin (Reman) Eye drops, 0.5%, Tk. 150.00/5 ml; Eye ; 1.5%, Tk. 150.00/5 ml

LOMEFLOXACIN

Indications: same as that of Ciprofloxacin. Bactericidal cone in AC reached by topical application. Incidence of resistance is less frequent than ciprofloxacin. It can be given in children under 14 years of age

Side-effect: photosensitivity

Dose : one drop twice daily

Proprietary Preparations

Lomefloxacin 0.3%.

Contra (Beximco), Eye drops, Tk. 60/5 ml

Lomebac (Popular), Eye drops, Tk. 70/5 ml

Lomecin (Reman) Eye/Ear drops, Tk. 70/5 ml;

Lomeflox (Aristo), Eye drops, Tk. 70/5 ml

Lomege (General), Eye drops, Tk 70/5 ml

Lomequin (Incepta), Eye drops, Tk 70/5 ml

Lomexa (Opsonin), Eye drops, Tk. 52.63/5ml

Lyflox (Ibn Sina), Eye drops, Tk 70/5 ml

Meflocin (Asiatic), Eye drops, Tk 70/5 ml

Mexlo (Square), Eye drops, Tk 70/5 ml

Namicin (Nipa), Eye drops, Tk. 70/5 ml

Omeflox (ACI), Eye drops, Tk. 50.19/5 ml

Ophaflox (Drug Int.) Eye drops, Tk. 60/5 ml

Optiflox (Jayson), Eye drops, Tk. 50.20/5 ml

Optilom (Healthcare), Eye drops Tk.80/5 ml

Safquin (Apex), Eye drops, Tk.60/5 ml

MOXIFLOXACIN

Indications: same as that of Ciprofloxacin with less chances of resistance.;less effective in *Pseudomonas than* Ciprofloxacin

Cautions: not recommended for neonates

Side-effects: taste disturbances, ocular discomfort (including pain, irritation and dryness), hyperaemia;

Dose:varies according to the dose of infection. ADULT and CHILD over 1 month, apply 3-8 times daily (continue treatment for 2-3 days after infection improves; review if no improvement within 5 days)

Proprietary Preparations

Moxifloxacin 0.05%.

Cinagen (Navana), Eye drops, Tk.100/5 ml

Eyemox (Acme), Eye drops, Tk.100.38/5 ml

Flomox (Opso Saline), Eye drops, Tk.75.47/5ml

Floromox (Ibn Sina), Eye drops, Tk.100/5ml

Floxalone (Drug Int.), Eye drops, Tk. 80/5 ml

Floximox (Asiatic), Eye drops, Tk.100/5 ml

10. EYE

Iventi (*Square*), Eye drops, Tk. 100.38/5 ml
Maxiflox (*ACI*), Eye drops, Tk. 100.38/5 ml
Mfc (*Nipa*), Eye drops, Tk. 100/5ml
Moxibac (*Popular*), Eye drops, Tk. 100.38/5ml
Moxigen (*General*), Eye drops, Tk. 100/5 ml
Moxigram (*Apex*), Eye drops, Tk. 100/5 ml;
Moxilocolin (*Opsonin*), Eye drops, Tk. 75.47/5ml
Moxiquin (*Incepta*), Eye drops, Tk. 100/5 ml;
Moxivin (*Healthcare*), Eye drops, Tk. 100/5 ml
Moxquin (*Incepta*), Eye drops, Tk. 100/5 ml
Ocumox (*Reman*), Eye drops, Tk. 100.38/5ml
Odyacin (*Beximco*), Eye drops, Tk. 100/5 ml
Optimox (*Aristo*), Eye drops, Tk. 100/5 ml
Visomox (*Eskayef*), Eye drops, Tk. 100/5 ml

Moxifloxacin with xanthin gum

Moxiquin XG (*Incepta*) Eye drops, Tk. 150/5ml

OFLOXACIN

Indications: same as that of *Ciprofloxacin*

Cautions: corneal ulcer or epithelial defect (risk of corneal perforation); Pregnancy and breast-feeding.

Side-effects: ocular discomfort and irritation; also reported facial oedema, keratitis, visual disturbances, photophobia, increased lacrimation, ocular oedema, dry eyes, ocular hyperaemia

Dose: see section 10.2.

Proprietary Preparations

Ofloxacin 0.3%

Obactin (*Ibn Sina*), Eye drops, Tk. 85.00/5 ml

Vista (*Aristo*), Eye/ Ear drops, Tk. 85.00/5 ml

SULPHACETAMIDE

Bacteriostatic; action on Gram-positive, Gram-negative organisms and Chlamydiae (see section 1.1.6).

Indications : trachoma and inclusion conjunctivitis

Side-effects: irritation, burning, conjunctival hyperemia, and allergic reactions

Dose : see notes above.

Proprietary Preparations

Optacid (*Reman*), Eye drop, Tk. 45.00/10ml

PEPTIDE ANTIBIOTICS

They are usually used in combination (except vancomycin).

BACITRACIN

This bactericidal drug has similar spectrum like that of penicillin but it does not produce allergy.

Indication: local treatment of *Staphylococcal blepheroconjunctivitis*

Dose : see section 10.2

Proprietary Preparation

See under neomycin

FUSIDIC ACID

Indications: broad spectrum antibiotic; effective mainly against Gram-positive organisms especially *Staphylococci*.

Caution: high rate of development of resistance

Dose: twice daily application is sufficient for acute conjunctivitis

Proprietary Preparations

Fucithalmic^(l) (*Leo*), Eye drop 1%, Tk. 249.78/5g

GRAMICIDIN

same as that of bacitracin.

POLYMYXIN B

Bactericidal; effective particularly against gram negative organisms including *Pseudomonas (proteus is resistant)*. It can not penetrate into the eye.

Dose : see in section 10.2

POLYMYXIN

Proprietary Preparation

Neomycin 3.4 Iac IU+ Polymyxin 1 Iac IU+ Hydrocortison 100IU

NPH (*Reman*), Eye/Ear drop, Tk. 60.23/5ml

VANCOMYCIN

Indications: active against many Gram-positive organisms including *Streptococci*, *Staphylococci*, *Corynebacterium*, *Clostridium*; (Gram-negative bacteria, *Mycobacteria* and fungi are resistant)

Dose: for intravitreal injection 1mg in 0.1 ml. Intravitreal injection to be given only by experts in the OT for endophthalmitis

Proprietary Preparations

See section 1.1.12 under vancomycin

TETRACYCLINES

Bacteriostatic; effective against wide spectrum of Gram-positive and Gram-negative organisms, *Chlamydia*, *Borrelia*. Many strains like *Proteus*, *Pseudomonas*, *Staphylococci* develop resistance (see also section 1.1.7)

TETRACYCLINES^[ED]

Indications : chlamydial infections (trachoma and inclusion conjunctivitis)

Contraindications : pregnancy and lactation

Side-effects: more chance of super infection

Dose : see section 10.2

Proprietary Preparations

Tetracycline hydrochloride 1%

A-Tetra (Acme), Eye Oint., Tk.11.55/5gm; Tk.8.50/3.5gm

G-Tetracycline (Gonoshasthaya), Eye/Ear Oint. Tk. 8.00/5 gm

CEPHALOSPORINS**CEFUROXIME**

It can be administered by intracameral injection for the prophylaxis of endophthalmitis following cataract surgery.

Indication: prophylaxis of endophthalmitis after cataract surgery

Cautions: severe risk of infection, complicated cataracts or combined operations with cataract surgery, severe thyroid disease, reduced corneal endothelial cells (less than 2000)

Dose: by intracameral injection, ADULT over 18 years, 1mg into the anterior chamber of the eye at the end of cataract surgery

Proprietary Preparations

see section 1.1.2 under cefuroxim

ANTIBIOTIC STEROID COMBINATIONS

Following combination products are used in different infective conditions.

Chloramphenicol+Dexamethsone

see section 1.1.12;&5.3.2

Ciprofloxacin+ Dexamethsone

see section 1.1.7& 5.3.2

Gatifloxacin+ Dexamethsone

see notes above

Proprietary Preparations

see under chloramphenicol, ciprofloxacin & gatifloxacin

10.2.2 ANTIFUNGALS

Fungal infection of the eye is one of the important considerations for tropical, hot & humid countries. Fungi can infect any part of the eye or its adnexia. There are two important causes of fungal infection; one is trauma; trauma may be accidental- particularly involving plants and vegetable matter, surgical trauma and **Immunosuppression** due to prolong use of antibiotics, topical or systemic steroid preparations.

Superficial mycoses appear on the lids, lid margins, conjunctiva. Keratomycosis (affection of the cornea) usually follows trauma. One should suspect its presence in all cases of agricultural trauma. Filamentous fungi are mostly found after trauma in our country. Mycotic endophthalmitis may occur after perforating injury or intraocular surgery.

10. EYE

Mycotic affection should be confirmed by simple microscopic examination of the infected materials (KOH preparations and Gram staining).

POLYENE ANTIBIOTICS

AMPHOTERICIN B

Most effective broad spectrum antibiotic for systemic fungal infection.

Indications : keratomycosis, metastatic and endogenous endophthalmitis. Effective against yeast and filamentous fungi (see also section 1.2.1).

It has numerous side-effects after IV use.

Use in ophthalmology is limited to intravitreal injections to be given by experts for fungal endophthalmitis.

Can be used topically after preparing in conc. of 0.1% to 1% but the preparation is very much irritant for routine use. (see also section 1.2.1)

NATAMYCIN

Can be used topically only; wide spectrum like amphotericin B.

Indications: effective against filamentous fungi and *Candida albicans*. It may be supplemented by ketoconazole

Side-effects: it only penetrates superficially into the cornea so it can not be used for deep fungal infections.

As debridement of corneal epithelium aids its penetration, it is an important tool for successful treatment.

Dose : see notes above (sec. 10.2)

Proprietary Preparations

Natamycin 5%

N-Myci (Aristo), Eye drops, Tk.100/5 ml

Natapro (Popular), Eye drops, Tk. 100/5 ml

Natoph (Ibn Sina), Eye drops, Tk. 100/5 ml

Nicin (Nipa), Eye drops, Tk.100/5ml

Natadrop(Reman)),Eye drops, Tk.100/5 ml

AZOLE DERIVATIVES

IMIDAZOLE

The drug is less toxic than polyenes.

Indication: acanthaemeba infection; because of its action on sterol synthesis,

this drug should not be used concurrently with polyenes; (see also section 12.2.2)

CLOTRIMAZOLE^[ED]

(see also section 12.2.2)

Indications : wide spectrum against *Aspergillus* and *Candida*; less effective against *Fusarium*. Used topically and systemically against *Acanthaemeba* also.

Proprietary Preparations

Clotrimazole 1%

Aristen(Aristo), Eye Oint., Tk. 55.00/4 gm

Clarizol(Incepta), Ear/Ear drops, Tk 80/10 ml

Fungizol (Reman), Eye Oint Tk.55.5/4gm

Eye/Ear drop, Tk.80/10ml.

KETOCONAZOLE

Candidal infection; well absorbed after oral administration; relatively non-toxic.

Indications: candidal albican infections

Cautions: if therapy is to be continued for more than 2 weeks; then s-GPT, s-GOT enzymes to be monitored.

Side-effects: pruritus, nausea, vomiting, diarrhoea, hepatotoxicity.

Dose: 200-800 mg daily with meal. Treatment must be maintained over weeks to months.

Proprietary Preparation

(see Section 1.2.1)

TRIAZOLES

FLUCONAZOLE^[ED]

Indications : effective against *Candida* and *Cryptococcus* infections.

Absorption on oral administration is excellent.

Proprietary Preparations

(See Section 1.2.1)

Fluconazol 0.3%

Naz (Reman)Eye drops, Tk. 100.5/5 ml

Nispor (Incepta), Eye drops, Tk. 80/5 ml

10.2.3 ANTIVIRALS

(see also section 1.4)

The common viral agents are adeno virus, herpes, simplex and zoster virus which commonly infect lid, periorbital skin, conjunctiva, cornea, retina. Antiviral agents should not be used for undiagnosed red eye with corneal affection as these agents itself might cause different complications. Antiviral topical drugs are most effective against herpes simplex. In herpes zoster infection systemic antiviral drugs are the drugs of choice.

ACICLOVIR^[ED]

(see also section 1.4.1)

Acts specifically on virus infected cells; relatively non-toxic. It can penetrate corneal epithelium and stroma.

Indications : Stromal herpetic keratitis and disciform keratitis.

Side-effects : Superficial punctate keratitis, transient stinging.

Dose : ointment 5 time a day for herpes simplex.

Proprietary Preparation

Aciclovir 3%

Acyvir (*Aristo*), Eye Oint., Tk. 100.00/5 gm

Clovir (*Ibn Sina*) Eye Oint., Tk. 100.00/5 gm

Cuvir (*General*), Eye Oint., Tk. 100.00/5 gm

Cyclovex (*Opso Saline*), Eye Oint., Tk.

33.96/3gm

Virin (*Nipa*), Eye Oint., Tk. 100.00/5gm

GANCICLOVIR

Indications: local treatment of herpes simplex infections

Side-effects: burning sensation, tingling, superficial punctate keratitis

Dose: Apply 5 times daily until healing complete, then apply 3 times daily for a further 7 days

Proprietary Preparations

Ganciclovir 0.15%

Ganclovir (*General*), Eye Gel Tk. 200/5 gm

Xoviral (*Aristo*), Eye Gel, Tk. 200/5 gm

Zirgan (*Ibn Sina*), Eye Gel, Tk. 200/5 gm

IDOXURIDINE (IDU)

Indications : herpes simplex keratitis (see also section 1.4.1)

Side-effects : corneal punctate erosions, follicular conjunctivitis, scarring of conjunctiva, delayed wound healing, superficial pannus, lacrimal obstruction, punctal occlusion, contact dermatitis

Dose : one drop hourly

Proprietary Preparation

Herplex (*Opso Saline*), Eye drops, 1 mg/ml, Tk. 45.29/10 ml

TRIFLURIDINE

Indications : indicated for the treatment of primary keratoconjunctivitis and recurrent epithelial keratitis due to herpes simplex virus, type 1 and 2.

Side-effects: mild, transient burning or stinging sensation upon instillation. Other side effects are superficial punctate keratopathy, epithelial keratopathy, hypersensitivity reaction, stromal edema, irritation, keratitis sicca, hyperemia and increased intraocular pressure.

Dose: 1 drop every 2 hrs while awake; maximum 9 drops/day until the corneal ulcer has completely re-epithelialized

Proprietary Preparation

Fludin (*Aristo*), Eye drops, 1%, Tk. 950/5 ml

10.3 CORTICOSTEROIDS, OTHER ANTI-INFLAMMATORY PREPARATIONS, AND ANTIHISTAMINES

CORTICOSTEROIDS

(see also section 5.3)

Corticosteroids can be administered topically to reduce ocular inflammation. These drugs, when administered topically, by subconjunctival injection, and systemically have an important place in treating uveitis and scleritis; they are also used to reduce post-operative inflammation following eye operations.

10. EYE

Topical corticosteroids should be used under expert supervision; they should not be prescribed for undiagnosed 'red eye'. The greatest danger in their use is that, by interfering with local defense mechanisms, they may either worsen the existing eye infection (particularly due to virus e.g. herpes simplex keratitis or fungus) or aggravate the condition which may lead to loss of vision or even loss of the eye.

Due to the use of eye drop formulations, a 'steroid glaucoma' may be produced in people susceptible to steroid. Other side effects include cataract, thinning of the cornea and sclera (with perforation); delayed hypersensitivity reactions. In the children Cushing's syndrome can occur from systemic absorption due to prolonged use.

Systemic corticosteroids may be useful for various ocular conditions. The risk of producing glaucoma is not great, but 'steroid cataract' can develop if more than 15mg of prednisolone is given daily for several years. The longer the duration, the greater is the risk. Other risks of systemic steroid administration should also be kept in mind.

One of the great concerns for the use of topical steroid in our country is that there is the increasing tendency for the use of corticosteroids for chronic allergic conjunctivitis. As patients get benefit from it, they medicate themselves for prolonged period without having the knowledge of the complications.

Subconjunctival injection is short lasting than subtenon injection, which is technically difficult. Sometimes crystalline suspensions are given in the periocular route which stays longer (4-8 week or longer) and high conc. can be achieved within the vitreous cavity, choroids and optic nerve. Only experts should consider intravitreal route.

COMPARISON OF DIFFERENT TOPICAL STEROID PREPARATIONS

Prednisolone acetate exhibits the greatest anti-inflammatory activity on the

anterior segment of the eye including concentration in the aqueous.

Dexamethasone has a longer half-life in ocular tissue than other necessitating less frequent application. The drug can reach deep ocular tissue.

Fluoromethalone has lower incidence of steroid induced glaucoma.

Fluoromethalone alcohol is less effective than prednisolone acetate. But fluoromethalone acetate is nearly as effective as prednisolone acetate.

Loteprednol also has lower propensity to increase intra ocular pressure.

BETAMETHASONE^[ED]

Indications: treatment for local inflammation

Cautions: see notes above

Dose: single drop every 1-2 hours until inflammation is controlled; then the frequency is to be reduced; in case of eye ointment 4 times daily or at night when used with eye drops

Proprietary Preparations

Eyebet (*Incepta*), Eye Drops, Tk. 30/5 ml

Betamethason esodium phosphate 0.1% +

Neomycin sulfate 0.5%

Betacin-N (*Ibn Sina*), Eye/Ear/ Nasal drops, Tk. 35.00/15 gm

Betricin (*Nipa*), Eye/Ear/ Nasal drops, Tk. 35.00/5ml; Oint., Tk. 10.77/3gm

Bn (*Asiatic*), Eye/Ear/Nasal drops, Tk. 32/5 ml

Optison-N (*Opso Saline*), Eye/Ear N/drops, Tk. 22.86/5 ml; Oint., Tk. 7.92/3 gm

DEXAMETHASONE^[ED]

Indications: short term treatment for local inflammation

Cautions: see notes above.

Dose: apply eye drops every 6 hours daily; in severe conditions every 30 minutes until inflammation is controlled; then the frequency is to be reduced.

Proprietary Preparations

Dexamethasone 0.1% (Eye drop).0.05% (Eye ointment)

Acicot (*ACI*), Eye/Ear drops, Tk. 60.00/5 ml

Celudex(Drug Int.), Eye/Ear drops,Tk.60/5ml
Dexacort (Opso Saline), Eye/Ear drops, Tk. 52.63/5 ml
Dexadron(Reman) Eye/Ear drops, Tk. 60.23/4ml
Dexagen (General), Eye drops,Tk. 70/5 ml
Dexagen (General), Eye Oint.Tk. 60/5 ml
Dexamet (Rephco), Eye drops, Tk. 45/5 ml
Dexamin(Jayson), Eye/Ear Drops,Tk. 50.20/5ml
Dexan (Chemist), Eye Drop , Tk. 60/4 ml
Dexon (Ibn Sina), Eye/Ear drops,Tk.70/5 ml
Dexon (Ibn Sina), Eye Oint.Tk. 60/5 ml
Dexonex(Square), Eye/Ear drops,Tk.60/5 ml
D-one (Nipa), Eye drops,Tk. 70/5 ml
Gludex (Kemiko),Eye/Ear DropsTk. 70/5 ml
Inflavis (Beximco),Eye/Ear drops,Tk. 60/5ml
Metadaxan(Incepta), Eye drops,Tk. 70/5 ml
Ocudex (Asiatic), Eye drops, Tk. 70.00/5 ml
Orbidex(Popular), Eye/Ear drops, Tk.70/5ml
Sonexa (Aristo), Eye drops, Tk. 70/5 ml; Oint., Tk. 60/3 gm
Steron (Acme), Eye drops,Tk. 70.00/5 ml

Tobramycin 0.3% + Dexamethasone 0.1%.
Cinarex-D (Beximco), Eye drop, Tk.150/5 ml
Texa (Drug Int), Eye drops , Tk. 125/5 ml
Tobicort (Asiatic), Eye Drops, Tk. 150/5 ml
Steron-T (Acme), Eye drops, Tk. 130/5 ml
T-Mycin plus (Aristo), Eye Oint.,Tk. 90/3.5ml; Tk. 150/5 ml
Tomycin-D (Ibn Sina), Eye drops, Tk. 150/5 ml; Tk. 90/3.5 ml

FLUROMETHALONE

Indications: Treatment for local inflammation

Cautions: see notes above

Dose: apply eye drops every 1-2 hours until inflammation is controlled; then the frequency is to be reduced

Proprietary Preparations

Fluorometholone 0.1%
NGS (Opso Saline), Eye drops,Tk. 67.67/5 ml
AFM (Aristo), Eye drops, Tk. 100/5 ml
Flurolon (General), Eye drops,Tk. 100/5 ml
Flurom (Apex), Eye drops, Tk. 80/5 ml
Fluromet (Popular), Eye dropsTk. 100/5 ml
Fluorocin(Reman), Eye drops,Tk. 79/5 ml
Flumeth (Nipa), Eye drops, Tk. 100/5 ml
Metalone (Incepta), Eye drops Tk. 90/5 ml
Metholone(Kemiko), Eye drops,Tk. 90/5 ml
Otholon (Navana), Eye Drops, Tk. 90/5 ml
Rubalon (Beximco), Eye drops,Tk. 90/5 ml

Fluorometholone 0.1%+ Gentamicin 0.3%
AFM-Plus (Aristo), Eye Oint., Tk. 100/3gm ; Eye drops, Tk. 110/5 ml

Inflagen (Asiatic), Eye Drops, Tk. 130/5 ml

Fluorometholone +Tetrahydrozoline

AFM-T (Aristo), Eye drops, 0.1%+ 0.025%, Tk.100/5 ml

Metalone Plus (Incepta), Eye drops, 0.1%+ 0.025%, Tk. 110/5 ml

Eylon (Ibn Sina), Eye Drops, 0.1%+ 0.025%, Tk. 100/5 ml

Refemoline (Reman), Eye drop, Tk. 100/5ml

Fluorometholone 0.1%+ Neomycin Sulphate 0.5%.

Flucort-N (Gaco), Eye Drop, Tk. 96.09/5ml

Flumelone-N (Reman), Eye Drop, Tk. 95.50/5ml

LOTEPREDNOL ETABONATE

Indications: treatment of post-operative inflammation following ocular surgery

Cautions: see notes above

Side-effects:

Dose. Apply 4 times daily starting 24 hours after surgery; max. duration of treatment 14 days

Proprietary Preparations

Loteprednol Etabonate 0.5%

Lotepred (Aristo), Eye drops, Tk. 175/5 ml

Loteflam (General), Eye drops Tk. 175/5 ml

Lotepro (Incepta), Eye drops, Tk. 175/5 ml

Lotenol (Popular), Eye drops, Tk. 175/5 ml

Loteprednol Etabonate 0.5% + Tobramycin 0.3%

Lotepro Plus (Incepta), Eye drops, Tk. 200/5 ml

Loteflam T (General), Eye drops, Tk. 200/5ml

Loteba (Navana), Eye drops Tk. 200/5 ml

Lotenol T (Popular),Eye drops, Tk.200.75/5ml

Lotepred Plus (Aristo), Eye drops, Tk.200/5ml

PREDNISOLONE^[E]

Indications: local inflammation

Cautions: see notes above

Dose: apply eye drops every 1-2 hours until inflammation is controlled; then the frequency is to be reduced

Proprietary Preparations

Prednesolone acetate1%

Cortan (Incepta), Eye drops, Tk. 100/5 ml

Cortisol(Aristo), Eye drops, Tk.100/5 ml

Isolon (Ibn Sina), Eye drops, Tk. 100/5 ml;

Ocusol (Popular), Eye drops, Tk. 100/5 ml

Pednisol (Drug Int.), Eye drops, Tk. 90/5 ml

Predflam (General), Eye drops, Tk. 100/5 ml

10. EYE

Prednicort (*Asiatic*), Eye drops, Tk.100/5 ml
Prednol(*Reman*),Eye drop,Tk.100/5ml

Prednesolone acetate+neomycin sulfate+polymixin B sulfate

Polyforte (*Aristo*), Eye drops,Tk.150.00/5 ml
PoyPred⁽¹⁾(*Allergen*),Eye drops,Tk.188.42/5 ml

NON STEROIDAL ANTI INFLAMMATORY DRUGS (NSAIDs)

NSAIDs that reduce inflammation following ophthalmic surgery include **flurbiprofen**, **diclofenac** and **ketorolac**. **Flurbiprofen** and **diclofenac** may also be used to induce mydriasis and reduce surgical miosis. NSAIDs act through inhibition of prostaglandin E₂ synthesis. Unlike topical steroids, they do not cause increased risk of infection. But all cause burning sensation after instillation (see also section 9.1.1).

Indications:

- Preoperatively for maintaining blood aqueous barrier and for inhibition of intraoperative miosis during cataract surgery (**flurbiprofen** and **diclofenac**).
- Pre and post operatively to control inflammation and for analgesia (**diclofenac**).
- To control inflammation in episcleritis, scleritis, chemical injury.
- Allergic conjunctivitis (**ketorolac 0.5%** is more useful than others)

BROMOFENAC

Indication: treatment of postoperative inflammation and reduction of ocular pain in patients who have undergone ocular surgery (cataract extraction, IOL implantation etc).

Dose: applied to the affected eye(s) two times daily beginning 24 hours after ocular surgery and continuing through the first 2 weeks of the postoperative period.

Side effects: abnormal sensation in eye, conjunctival hyperemia, eye irritation (including burning/stinging), eye pain, eye pruritus, eye redness, headache and iritis

Proprietary Preparations

Bromfenac 0.09%
Xirom (*Aristo*), Eye dropsTk. 100/5 ml
Romfen (*Eskayef*), Eye drops, Tk. 100/5 ml
Rotarac (*ACI*), Eye drops,Tk. 95.36/5 ml
Xibrofen (*Incepta*), Eye drops, Tk. 100/5 ml
Bromofen (*Ibn Sina*), Eye drops, Tk.100/5ml
BSH (*Opso Saline*), Eye drops, Tk.75.19/5ml
Bromnac (*Opsonin*), Eye drop, Tk.75.47/5ml
Ocufen (*Square*), Eye drops, Tk.100.38/5 ml
Acunac (*General*), Eye drops, Tk. 100/5 ml
Bfenac (*Popular*), Eye drops, Tk. 100/5 ml
Refenac(*Reman*),Eye drop Tk.100/5ml

DICLOFENAC SODIUM

Preoperative: up to 1 drop 5 times over the 3 hours preceding surgery

Postoperative: 1 drop 3 times immediately after surgery, thereafter 1 drop 3-5 times daily

Other indications: 1 drop 4-5 times daily

Proprietary Preparations

Diclofenac sodium 0.1%
Afenac (*Nipa*) Eye drops,Tk.80/5ml
Anodyne (*Ibn Sina*), Eye drops,Tk. 80/5 ml
Diclofen (*Opsonin*), Eye drops,Tk.60.15/5ml
Diclofen(*Opso Saline*),Eye drop, Tk.60.15/5ml
Diclon (*Reman*),Eye/Ear drop Tk.78.50/5ml
Dinac (*Navana*), Eye drops, Tk. 80/5 ml
Erdon (*Aristo*), Eye drops,Tk. 80/5 ml
Intafenac (*Incepta*), Eye drops, Tk. 80/5 ml
Locopain (*Asiatic*), Eye drops,Tk. 80/5 ml
Mobifen (*ACI*), Eye drops, Tk. 75.28/5 ml
Nopain (*Drug Int.*), Eye drops, Tk.75/5 ml
Profenac (*Popular*), Eye drops Tk. 75.28/5ml

FLURBIPROFEN SODIUM

Prevention of miosis: 1 drop half hourly beginning 2 hour before surgery

Postoperative inflammation: 1 drop 4 times daily for 2-3 weeks

Prevention of cystoid macular oedema: 1 drop 4 times daily for 3-6 months

Proprietary Preparation

Ocufen^(b) (Allergen), Eye drop. 0.03%,
Tk.164.54/5ml

KETOROLAC TROMETHAMINE

Dose: 1 drop 3 times daily

Proprietary Preparations

Ketorolac Tromethamin 0.5%.

Emodol (Jayson), Eye drops, Tk. 70/5 ml
Etolac (Ibn Sina), Eye drops, Tk. 85/5 ml
Etorac (Incepta), Eye drops, Tk. 80/5 ml;
Lopadol (Popular), Eye drops, Tk. 80.30/5 ml
Ofpain (Kemiko), Eye drops, Tk. 80/5 ml;
Pair (Drug Int), Eye drops, Tk. 70/5 ml.
Pair (Drug Int), Eye drops, Tk. 70/5 ml. ;
Regular (Reman), Eye drop Tk. 80.30/5ml
Surpim (Asiatic), Eye drops, Tk. 80/5 ml.;
Todol (Opsonin), Eye drops, Tk. 60.38/5 ml.;
Toroaid (General), Eye drops, Tk. 80/5 ml
Winop (Acme), Eye drops Tk. 80/5 ml
Xidolac (Beximco), Eye drops, Tk. 80/5 ml.

KETOTIFEN FUMERATE

Indications: seasonal allergic conjunctivitis

Side-effects: transient burning or stinging, punctate, corneal epithelial erosion; less commonly dry eye, subconjunctival hemorrhage, photophobia, headache, drowsiness, skin reaction, and dry mouth also reported.

Dose: ADULT and CHILD over 3 years, apply twice daily

Proprietary Preparations

Ketotifen 0.025%.

Alarid (Square), Eye drops, Tk. 95.36/5 ml
Aljen (Apex), Eye drops, Tk. 95/5 ml
Fenat (Drug Int), Eye drops, Tk. 95/5 ml
Ketof (Ibn Sina), Eye drops, Tk. 100/5 ml
Ketomar (Incepta), Eye drops, Tk. 100/5 ml
Kofen (Opsonin), Eye drops, Tk. 75.19/5 ml
Masfen (Opso Saline) Eye drops, Tk. 75.19/5ml
Ocutif (Asiatic), Eye drops, Tk. 95/5 ml
Ocutifen (General), Eye drops, Tk. 95/5 ml
Prosmia (ACI), Eye drops, Tk. 95.36/5 ml
Stafen (Aristo), Eye drops, Tk. 100/5 ml
Tofen (Beximco), Eye drops, Tk. 95/5ml
Zadit (Popular), Eye drops, Tk. 95.36/5ml

NEPAFENAC

Indication: post-operative ocular pain and inflammation including cataract surgery

Inhibition of surgery induced miosis and Prevention of post-operative cystoid macular edema (CME).

Dose: For post-operative pain & inflammation: 1 drop 3 times daily 1 day prior to cataract surgery and continued on the day of surgery and through the first 2 weeks of the post-operative period.

For surgery induced miosis: 1 drop 3 times daily 1 day before surgery & on the day of surgery.

For prevention of post-operative CME: 1 drop 3 times daily 1 day before surgery and continued on the day of surgery and through the first 6 weeks of the post-operative period.

Side effects: are foreign body sensation, lid margin crusting, ocular discomfort, ocular hyperemia etc.

Proprietary Preparations

Nevan (Aristo), Eye drop, 0.1%, Tk.150/5ml
Opanac (Beximco), Eye drop, 0.1%, Tk.150/5ml
Optafenac (Popular), Eye drop, 0.1% Tk.150/5ml

ANTI-HISTAMINES

see also section 4.8.1 & 11.2.1

Topical antihistamines (e.g. pheniramine maleate, pyrilamine maleate, antazoline) usually combined with a vasoconstrictor (e.g. naphazoline, phenylephrine). **Bepotastine besilate** is also used to treat allergic conjunctivitis. They decrease itching and normalize vascular permeability in allergic conjunctivitis. These drugs are very useful for the urban people of our country where incidence of allergy is more. Prolong use has little side effect as compared to steroids. These drugs give temporary relief.

Cautions: hypertension, cardiac arrhythmia.

Dose: 1 drop 5 times daily.

10. EYE

ALCAFTADINE

Indications: For symptoms & signs of allergic conditions of the anterior segment of the eye.

Side-effects: mild irritation, burning & redness

Dose: 0.25%; one drop once daily

Proprietary Preparations

Alcadin (*Popular*), Eye drop, 0.25%, Tk. 400/5 ml

Alcafta (*Incepta*), Eye drop, 0.25%, Tk. 400/5 ml

Caftadin (*Aristo*), Eye drop, 0.25%, Tk. 400/5 ml

ANTAZOLINE SULFATE

Indications : allergic conjunctivitis

Cautions:hypertension; hyperthyroidism; diabetes mellitus; angle-closure glaucoma; phaeochromocytoma; cardio-vascular disease; urinary retention; interactions:

Side-effects: transient stinging; also reported blurred vision, mydriasis, eye irritation

Dose : ADULT and CHILD over 12 years apply 2–3 times daily (max. 7 days)

ANTAZOLINE 0.05%+TETRYZOLINE 0.04%.

Proprietary Preparations

Zocare (*Healthcare*), Eye Drops , Tk. 115.00/5 ml

BEPOTASTINE BESILATE

Indications : itching associated with signs and symptoms of allergic conjunctivitis.

Dose: apply one drop into the affected eye(s) twice a day .

Proprietary Preparations

Bepotastine Besilate

Bepotas (*Aristo*), Eye Drops, 1.5%, Tk.300/5ml

Bepogen (*General*), Eye Drops, 1.5%, Tk. 300/5ml

Betastin (*Incepta*), Eye Drops, 1.5%, Tk. 300/5ml

Betasil (*Ibn Sina*), Eye Drops, 1.5%, Tk.300/5ml

EMEDASTINE

Indications: seasonal allergic conjunctivitis

Side-effect: transient burning or stinging; blurred vision; local oedema; keratitis; irritation; dry eye; infiltrates (discontinue); and staining; phyophobia; headache and rhinitis occasionally reported

Dose: ADULT and CHILD over 3 years apply twice daily.

Proprietary Preparation

Emadin ^(l) (*Alcon*), Eye drops 0.05%, Tk. 327.02/5ml

EPINASTINE HYDROCHLORIDE

Indications: seasonal allergic conjunctivitis

Side-effects: burning; less commonly taste disturbance, headache, conjunctival hyperaemia, dry eye, eye pruritus, visual disturbance, increased lacrimation, eye pain, nasal irritation, rhinitis

Dose: ADULT and CHILD over 12 years, apply twice daily; max. duration of treatment 8 weeks

Proprietary Preparations

Epinastine hydrochloride 0.05%

Alpatin (*Beximco*), Eye drops, Tk. 150.00/5 ml

Epinast (*Aristo*), Eye drops, Tk. 150.00/5 ml

Relestat^(l) (*Allergan*) Eye drops, Tk.296.73/5ml

MAST CELL STABILIZERS

(see also section 4.8.1 & 11.2.1)

SODIUM CROMOGLYCAT

It is a useful drug without major side effects. Majority of patients in our country suffers from allergy; it is strongly recommended for continued use if it is indicated for allergy.

Usually it has preventive role. Its effect builds up gradually and it needs uninterrupted application for more than one week.

When allergic reactions are higher, then short-term supplementation of steroid is needed.

Indication: Allergic conjunctivitis

Dose: 1 drop 4 times a day

Proprietary Preparations

Aristocrom (*Aristo*), Eye/Nasal drops, 2%, Tk. 65/10 ml

Cromolin (*Ibn Sina*) Eye drops, 4%, Tk. 75.00/5 ml

G-Crom (*Gonoshasthaya*), Eye/ Nasal drops, 2%, Tk. 50.00/10 ml

Icrom (*ACI*), Eye drops, 2%, Tk. 65.25/10 ml

Mastguard (*Incepta*), Eye drops, 2%, Tk. 60.00/10 ml; DS 4%, Tk. 100.00/10 ml

Nacrom (*Navana*), Eye drops, 2%, Tk. 65.00/10 ml

Nasochrom (*Drug Int.*), Eye / Nasal drops, 2%, Tk. 60.00/10 ml

Opsocrom (*Opso Saline*), Eye /Nasal Drops, 2%, Tk. 48.87/10 ml

Optacrom (*Reman*), Eye drop Tk.60.23/10ml

Optipan (*Jayson*), Eye drops, 2%, Tk. 50.77/10 ml

Sodicrom (*Popular*), Eye drops, 2%, Tk. 60.23/10 ml; DS, 4%, Tk. 100.00/10 ml

LODOXAMIDE

It is about 2500 times more potent than **cromoglycate** to inhibit mediator release from mast cell

Indication: allergic conjunctivitis

Dose: 1 drop 4 times a day. It needs to be used without interruption

Proprietary Preparation

Alomide[®] (*Alcon*), Eye drop. 0.1% Tk.312.61/5ml

OLOPATADINE

Inhibits the release of inflammatory mediators like histamine, tryptase, PGD₂ from human conjunctival mast cells thus prevents changes in vascular permeability.

Indication: seasonal allergic conjunctivitis

Side effects: transient burning and stinging; distinctive taste

Dose : ADULT and CHILD over 3 years, apply twice daily; max. duration of treatment 4 months

Proprietary Preparations

Alacot (*Square*), Eye drops, 0.1%, Tk. 100.38/5 ml.; 0.2%, Tk. 150.00/5 ml

Aladay (*Eskayef*), Eye drops, 0.1%, Tk. 100.00/5 ml.; 0.2% , Tk.150.00/5 ml

Alchek (*Apex*), Eye drops, 0.1% , Tk. 100.00/5 ml

Alercon (*Acme*), Eye drops, 0.2%, Tk. 150.00/5 ml.; 0.1%, Tk. 100.00/5 ml;

Alleloc (*Navana*), Eye drops, 0.1%, Tk. 100.00/5 ml

Contova (*ACI*), Eye drops, 0.1%, Tk. 100.38/5 ml

Lopadine (*Incepta*), DsEye drops, 0.2%, Tk. 150.00/5 ml.;0.1%, Tk. 110.00/5 ml

Ologen (*General*), Eye drops, 0.2%, Tk. 150.00/5 ml.; 0.1%, Tk. 100.00/5 ml

Olones (*Kemiko*), Eye Drops, 0.2%, Tk. 150.00/5 ml.

Olopan (*Beximco*), Eye drops, 0.1%, Tk. 100.00/5 ml.;DS 0.2%, Tk. 150.00/5 ml

Olpadin (*Aristo*), Eye drops, 0.1%, Tk. 100.00/5 ml.; 0.2%, Tk. 150.00/5 ml

Opatin (*Opsonin*), Eye drops, 0.2%, Tk. 113.21/5 ml.; 0.1%, Tk. 82.71/5 ml

Optadin (*Asiatic*), Eye drops, 0.1%, Tk. 100.00/5 ml

Patadin (*Popular*), Eye drops, 0.1%, Tk. 100.38/5 ml; 0.2%, Tk. 150.57/5 ml

Patalon (*Ibn Sina*), Eye drops, 0.1%, Tk. 110.00/5 ml.; 0.2%, Tk. 150.00/5 ml

Olodin (*Reman*) Eye drops, 0.1%, Tk. 100.38/5 ml.;

ZINC

Antagonistic to calcium which has a mast cell stabilizing effect.

Indication: same as that of cromoglycate

Proprietary Preparations

Z.-B (*Reman*), Eye drop, Zinc Sulphate 0.3% + Boric acid1%, Tk. 25.00/10ml

Naphazoline Nitrate 0.005% & Zinc Sulphate 0.02%.

Nazin (*Aristo*), Eye drops, Tk. 80/10 ml

Oculogen (*General*), Eye drops, Tk. 80/10 ml

Naphalon (*Reman*), Eye drop, Tk.80.30/5ml

10.4 MYDRIATICS, CYCLOPLEGICS AND TREATMENT OF GLAUCOMA

10.4.1 & 2 MYDRIATICS AND CYCLOPLEGICS

Anticholinergic agents (**Atropine**, **Homatropine**, **Tropicamide** etc.) have

10. EYE

both cycloplegic and mydriatic activity in variable degree. **Atropine** is the strongest agent whose action lasts for prolong period. Anticholinergic agents are usually used for refraction, pupillary dilatation and relief of inflammation. **1% Atropine** (in ointment form) is sometimes preferred for children under 5 years of age for refractive purposes.

Direct acting adrenergic agent, phenylephrine usually in a 2.5% concentration, is one of the most commonly used mydriatic for diagnostic purposes. It is also helpful for breaking posterior synechiae formed as a result of recent inflammation. It should be cautiously used in patients with ischaemic heart disease. **Phenylephrine** does not causes cycloplegia

Tropicamide or **phenylephrine** is sufficient for examination of the fundus. Sometimes for maximal dilatation

combination of **Tropicamide** and **Phenylephrine** or **tropicamide** and **Cyclopentolate** is used. For refraction in a CHILD, **1% cyclopentolate** is indicated and used commonly due to its start duration of actions

Indications: For relief of inflammation and to have profound cycloplegia, **atropine** is the drug of choice

Cautions: The use of these drugs should have restricted use. Patients should be well informed not to use it in the normal eyes. Darkly pigmented iris is more resistant to pupillary dilatation.

Side-effects: A few patients, usually middle-aged or elderly hypermetropic individuals, may develop an attack of acute angle closure glaucoma following mydriasis; this constitutes a severe and sights threatening emergency.

Tablet 10.4.1 A : List of drugs comparing different effects is given in the table

Drug	Mydriasis Maximal effect (min)	Mydriasis Full recovery (days)	Cycloplegia Maximal effect (hr.)	Cycloplegia Full recovery (days)
Atropine 1%	40	10+	6	14
Hyoscine (0.25% & 0.5%)	30	7	1	7
Homatropine (1% -5%)	60	3	1	3
Cyclopentolate (0.5%- 2%)	60	1	1	1
Tropicamide (0.5% & 1%)	40	0.25	0.5	0.25
Phenylephrine 2.5% & 10%	20	0.25	Nil	---

Cautions: There are risk of systemic side effects with atropine eye drops in infants under 3 months of age (ointment is used in these case)

Side-effects: Transient stinging, raised intraocular pressure, hyperaemia, oedema, conjunctivits, contact dermatitis

ATROPINE SULPHATE [ED]

Proprietary Preparations

Atropine sulfate 1%

Atrogen (General), Eye drops, 1%, Tk.50/5 ml; Tk. 70/10 ml

Atropine-OSL (Opso Saline), Eye drops, Tk. 25.95/5 ml; Oint, Tk. 14.05/3 gm

G-Atropine (Gonoshasthaya), Eye drops, 1%, Tk. 27.25/10 ml

Mydri-Atropin (Reman), Eye drop 1%. Tk. 40/10ml; 30/5ml; Oint. Tk. 25/4gm

CYCLOPENTOLATE

Proprietary Preparation

Mydrate (Beximco), Eye drops, 1%, Tk.120/5ml

HOMATROPINE HYDROBROMIDE

Proprietary Preparations

Homatropine hydrobromide 2%

Homatropine (*Reman*), Eye drop
Tk.56.55/10ml
Hemomin (*Nipa*) Eye drop 2 %
TK.56.55/10ml

TROPICAMIDE

Proprietary Preparations

Tropidil (*Popular*), Eye drops, 1%, Tk. 85.32/5ml
Tropicamide OSL (*Opso Saline*), Eye drops, 1%, Tk. 64.15/5 ml; 0.5%, Tk. 45.11/5 ml
Tropigen (*General*), Eye drops, 1%, Tk. 85/5 ml
Dilate (*Incepta*), Eye drops, 1%, Tk. 76/5 ml
Camide (*Ibn Sina*), Eye Drops, 0.5%, Tk. 60.22/5 ml; 1%, Tk. 80.31/5 ml
Tropicam (*Aristo*), Eye Drops, 0.5%, Tk. 60.00/5 ml ; 1%, Tk. 85.00/5 ml

Tropicamide 0.8% + Phenylephrine 5%,
Trophen (*Aristo*), Eye drops, Tk. 90/5 ml
Tropigen Plus (*General*), Eye drops, Tk. 80/5 ml
Dilate Plus (*Incepta*), Eye drops Tk. 80/5 ml
Tropidil Plus (*Popular*), Eye drops, Tk. 80.30/5 ml

10.4.3 DRUGS FOR GLAUCOMA

The complex primary pathologic mechanism in glaucoma consists of an incompatibility between intraocular pressure (IOP) and pressure tolerance of the tissues of the optic nerve head resulting in damage to the optic nerve fiber. IOP at which this incompatibility does occur varies from elevated IOP to an IOP totally within the normal range (**IOP not necessarily high always**). Thus the target IOP at which damage to optic nerve does not occur also varies from just within the normal range to well below the normal range.

Approximately two thirds of all glaucoma are primary. Among the primary open angle glaucoma is more prevalent in our country, which needs routine screening for its diagnosis.

Treatment is aimed at reducing IOP to a target pressure safe and compatible with the normal functioning of the optic nerve.

Control of primary open angle glaucoma can be achieved and maintained in many cases by drugs

only. But if it does not halt the progress of the disease or if there is non-compliance to drugs or if patient is not able to bear the cost of treatment, surgery is the treatment of choice.

Medical control of IOP can be achieved by using eye drops containing **miotics, beta blockers, sympathomimetic amines and prostaglandin analogues** or by systemic or topical therapy with carbonic anhydrase inhibitors (CAI).

At first the disease is to be treated with a topical beta-blockers and other drugs are to be added as necessary to control IOP.

For cases of acute primary angle closure glaucoma, **surgery is the only immediate and effective treatment** after medical control of IOP (mainly by **miotics, anhydrase inhibitors and even mannitol infusion**).

Among the secondary causes-steroid induced glaucoma, lens induced glaucoma, glaucoma secondary to uveitis and trauma are the main varieties. They should be treated according to the causes.

In emergency or before surgery, **mannitol** should be given by slow IV infusion until the intraocular pressure has been satisfactorily reduced. **Acetazolamide** by IV injection may also be used for the emergency management of raised intraocular pressure.

If supplementary topical treatment is required after iridectomy or a drainage operation in either variety of glaucoma, a **beta-blocker** is preferred to **pilocarpine**. This is because the risk that posterior synechiae will be formed as a result of the miotic effect of **pilocarpine** especially in angle closure glaucoma. It is then also advantageous to utilize the mydriatic side effect of adrenaline.

MIOTICS

It includes the cholinergic agonists **Pilocarpine** and **Carbachol**, and the anticholinesterases. They cause

10. EYE

constriction of the ciliary muscle, which helps to open the drainage channels in the trabecular meshwork between the iridocorneal junction and the canal of Schlemm. Small pupil is an undesirable side effect of the drug.

Among the miotics used for control of ocular pressure, only pilocarpine drop in different concentration (1%, 2%, 4%) is currently available in our country.

Cautions: Darkly pigmented iris of our population may require higher concentration of the **miotics** or more frequent administration. When frequent administration is needed; care should be taken to avoid overdose. Retinal detachment has occurred in susceptible individuals and those with **retinal disease** (especially with **long acting miotics**); therefore fundus examination is to be advised before starting treatment with a miotic. They should be used with caution in ischaemic heart disease, hypertension, bronchial asthma, peptic ulceration, urinary tract obstruction and Parkinson's diseases.

Contraindications: They are contraindicated in conditions where pupillary constriction is undesirable such as acute iritis, anterior uveitis and some form of secondary glaucoma. They should be avoided in acute inflammatory disease of the anterior segment.

Side effects: Ciliary spasm leads to headache and browache which may be more severe in the initial 2-4 weeks of treatment (particularly in patient under 40 years of age). Ocular side effects include blurred vision

PILOCARPINE^[ED]

Indications: cataract surgery, penetrating keratoplasty, iridectomy and other anterior segment surgery requiring rapid and complete miosis

Cautions: before finishing the surgery the injections should be removed by aspiration otherwise chances of

postoperative aseptic inflammation is more.

Contraindications: see notes above

Dose: apply eye drops every 5 minute to 4 times daily

Proprietary Preparations

Asipine (*Asiatic*), Eye drops, 2%, Tk. 80/10 ml

Optacarpine (*Popular*), Eye drops, 2%, Tk. 130.49/5ml, Tk. 200.00/10 ml

Pilocarpine (*Opso Saline*), Eye drops, 2%, Tk. 55.85/10ml

Pilodrop (*Reman*), Eye drops, 1%, Tk. 74.20/10ml; 2% Tk. 200/10ml; 4%, Tk. 212/10ml;

Piloma (*Opsonin*), Eye drops, 2%, Tk. 150.38/10 ml

BETA BLOCKERS

(see also section 3.1)

These blocking agents reduce IOP by decreasing the production of aqueous humour and produce minimal local adverse effects. They are used as eye drops which includes non-selective beta blockers (e.g. **Timolol**, **Carteolol**, **Levobunolol**) and cardioselective beta blockers (e.g. **Betaxolol**) preparations.

They are used in all types of glaucoma, irrespective of the state of the angle. **Beta blockers** combined with **Pilocarpine** has a good additive effect.

In absence of systemic contra-indications, they are the first choice of drugs for primary open angle glaucoma.

Cautions: Drainage via the lacrimal duct and absorption from the nasal mucosa into the systemic circulation can produce significantly high blood levels that can lead to systematic side effects (to minimize it patient is to be advised to close the eyes and apply digital pressure over the lacrimal puncta for a few minute after instillation). Cardioselective agents e.g. **Betaxolol**, may therefore be preferable to non-selective agents (**Carteolol**, **Levobunolol**, **Timolol**) in the elderly; caution is to be taken in patients with heart disease or bronchial asthma,

Systemic side effects: bronchospasm, bradycardia (always feel the pulse of the patient before prescribing a beta-blocker), hypotension, delayed recovery from hypoglycemia in insulin-dependent diabetes mellitus, fatigue, headache, nausea, impotence, decreased libido.

BETAXOLOL

Indications : *see notes above*

Contraindications : *see notes above*

Side effects : *see notes above*

Dose : apply eye drops twice daily

Proprietary Preparation

Betaxolol 0.5%.

Optaloc (*Popular*), Eye Drops, Tk.200.75/5ml

Optibet (*Jayson*), Eye Drops, Tk.150.56/5ml

LEVOBUNOLOL HYDROCHLORIDE

Indications : *see notes above*

Contraindications : *see notes above*

Side effects : *see notes above*

Dose : apply eye drops 2 times daily

Proprietary Preparation

Betagan⁽¹⁾ (*Allergan*), Eye drop 0.5%
Tk.193.56/5ml

TIMOLOL MALEATE

Indications : *see notes above*

Contraindications : *see notes above*

Side effects : *see notes above*

Dose : apply eye drops twice daily

Proprietary Preparations

Timolol - OSL (*Opso Saline*), Eye drops, 0.5%, Tk. 52.63/5 ml

Aristomol (*Aristo*), Eye drops, 0.5%, Tk. 70/5 ml

Asinol (*Asiatic*), Eye drops, 0.5%, Tk. 67/5 ml

Gemolol (*General*) Eye drops, 0.5%, Tk.70/5ml

Intramol (*Beximco*), Eye drop, 0.5%, Tk. 70/5ml

Timocare (*Healthcare*), Eye drops, 0.5%, Tk. 80/5 ml

Timolat (*Ibn Sina*), Eye drops, 0.5%, Tk.75/5ml

Timopress (*Incepta*), Eye drops, 0.5%, Tk. 70/5 ml

Timosol (*Rephco*), Eye drops, 0.5%, Tk. 70/5ml

Timodrop (*Reman*), Eye drops, 0.25%.Tk. 50/5ml; 0.5% Tk.75.00/5ml

Lotensin (*ACI*), Eye drops, 0.5%, Tk. 67.25/5 ml

Ocupres (*Popular*), Eye drops, 0.5%, Tk. 70.26/5 ml

Ticoma (*Opsonin*), Eye drops, 0.25%, Tk. 32.45/5 ml; , 0.5%, Tk. 52.83/5 ml

Proprietary Preparations

Timolol 0.5% +Brimonidine Tartrate 0.2%

Brimodin Plus (*Incepta*), Eye drops, Tk.110.00/5ml

Brimopres (*Popular*), Eye drops, Tk. 110.42/5ml

Combipres (*Aristo*), Eye drops, Tk.110.00/5ml

Combat (*General*), Eye drops, Tk.110.00/5ml

Locular Plus (*Square*), Eye drops, Tk.110.00/5ml

Ticoma B (*Opsonin*), Eye drops, Tk. 83.02/5ml

Dose : one drop twice daily

SYMPATHOMIMETICS

These drugs are alpha and beta adrenergic agonists.

Sympathomimetics increase aqueous outflow through their alpha agonistic action and decrease aqueous inflow through their beta agonist activity. Additive effect is poor with **timolol**, good with miotics (in which case miotic should be instilled first). Sympathomimetics are the first choice of drugs in the treatment Primary Open Angle Glaucoma (POAG) in patients who have systemic contraindications to **beta blocker**. They are useful in most secondary glaucoma, but should not be used in closed angle glaucoma (as it has mydriatic effect).

Adrenaline does not have any effect on ciliary body and is often most effective when used in conjunction with miotics.

Side-effects: severe smarting and redness of the eye

Cautions: it should be used with caution in patients with hypertension and heart diseases

10. EYE

ALPHA₂ AGONISTS

(see also section 3.2.6)

Alpha₂ agonists are used in the treatment of glaucoma include **apraclonidine** and **brimonidine**. They reduce the production of aqueous and increase uveoscleral outflow. In contrast to beta-blockers they have minimal effects on cardiovascular parameters and do not affect pulmonary function. **Brimonidine** is considered to be more selective than **Apraclonidine** for alpha₂ –receptors and as a result produces its ocular hypotensive effect without causing the mydriasis or conjunctival blanching seen with apraclonidine.

BRIMONIDINE TARTARATE

Indications: open-angle glaucoma or ocular hypertension.

Cautions: severe cardiovascular disease, depression, cerebral or coronary insufficiency, prgnancey, breast feeding & renal impairment

Contraindications: neonate or CHILD under 2 years, see notes above

Side effects: eye discomfort, itching, redness, blurred vision, dizziness, dry mouth, drowsiness, or tiredness

Dose: one drop 3 times a day, see notes above

Proprietary Preparations:

Alphagen^(l) (*Allergan*), Eye drops, 0.15%, Tk. 585.10/5ml

Alphaten (*Aristo*), Eye drops, 0.2%, Tk. 80/5ml

Bricoma (*Opsonin*), Eye drops, 0.2%, Tk. 60.38/5ml

Brimo (*Popular*), Eye oint, 0.2%, Tk. 80.30/5ml

Brimodin (*Incepta*), Eye drops, 0.2%, Tk. 80/5ml

Locular (*Square*), Eye drops, 0.2%, Tk. 80.30/5ml

CARBONIC ANHYDRASE INHIBITORS

see also section 3.5.5

These enzyme inhibitors decrease intraocular pressure by suppressing the production of aqueous humour.

ACETAZOLAMIDE^[ED]

Indications: reduction of intraocular pressure in open angle glaucoma, secondary glaucoma and perioperatively in angle-closure glaucoma

Cautions: not generally recommended for continuous use but if it is to be given plasma electrolytes and blood count should be monitored; pulmonary obstruction

Contraindications: hypokalaemia, hyponatraemia, hyperchloraemic acidosis; severe hepatic impairment; renal impairment; **Sulphonamide** hypersensitivity.

Side effects: nausea, vomiting, diarrhoea, taste disturbances, loss of appetite, flushing, headache, dizziness, fatigue, irritability, depression, thirst, polyuria, reduced libido, tingling of fingers, hand and feet, Steven-Johnson syndrome, blood dyscrasia, weak diuresis

Long-term use may lead to electrolyte disturbances, metabolic acidosis

Dose: for acute control of IOP 250-1000mg IV in divided dose; or 5mg/kg body weight; action onset of action is within 2 minutes and reaches to maximum 10-15 minute; Orally, 1g daily divided into 2-4 doses

Proprietary Preparation

Acemox (*Acme*), Tab., 250 mg, Tk. 2/Tab.

BRINZOLAMIDE

Indication: for short term management of glaucoma

Caution: check cardiovascular status

Dose: apply twice daily increased to max. 3 times daily if necessary

Proprietary Preparations

Brinzolamide 1%

Azopres (*Ibn Sina*), Eye drops, Tk.500/5 ml

Benozole (*Popular*), Eye drops, Tk. 500/5 ml

Brinzopt (*Aristo*), Eye drops, Tk. 500/5 ml
Genazopt(*General*), Eye drops, Tk.500/5 ml
Xolamid (*Opsonin*), Eye drops, Tk. 375.94/5ml
Zolamid (*Incepta*), Eye drops, Tk. 500/5ml

HYPEROSMOTIC AGENTS

These agents (e.g.Glycerol, isosorbide and mannitol) are used as dehydrating agent or to promote polyuria.

MANNITOL

(see section 3.5.4)

PROSTAGLANDIN ANALOGUES

Latanoprost and **Travoprost** most recently introduced drugs, which increase uveoscleral outflow.

BIMATOPROST

Indications : control the progression of glaucoma, for cosmetic purpose to lengthen eyelashes

Cautions: lashes may grow long that they become ingrown and scratch the cornea

Contraindication: should not be used if the patient is allergic to any ingredient in bimatoprost drops

Side Effects: blurred vision, eyelid redness, eye discomfort, burning sensation, thickening of the eyelashes.

Dose: apply once daily, preferably in the evening; CHILD under 18 years, not recommended

Proprietary Preparation

Bimapros (*Popular*), Eye drops, 0.03%, Tk. 500.00/5 ml

LATANOPROST

Indications: patients with open-angle glaucoma or ocular hypertension, closed-angle glaucoma

Cautions: intraocular inflammation, aphakia, patients with risk factors for macular edema, glaucoma, contact lens wearers, pregnancy and lactation

Contraindications: hypersensitivity to latanoprost, benzalkonium chloride, or any component of the formulation

Side Effects: blurred vision, burning and stinging, conjunctival hyperemia, foreign body sensation, itching, increased pigmentation of the iris, punctate epithelial keratopathy, bacterial keratitis

Dose: One drop in the affected eye(s) once daily in the evening.

Note: *Safety and efficacy have not been determined for use in patients with angle-closure glaucoma*

Proprietary Preparations

Lumigin^(I)(*Allergan*), Eye drops, 0.03%, Tk. 1140.60/3 ml

Repaprost(*Reman*), Eye drops0.05%, Tk. 496.87/2.5 ml

Xalaprost (*Beximco*), Eye drops, 0.03%, Tk. 460.00/2.5 ml

Xalatan^(I)(*Pfizer*) Eye drops0.05%, Tk. 703.75/2.5 ml

Timolol 0.5% + Latanoprost 0.005%

Topium DPI(*ACI*)Eye Drops, Tk.401.51/2.5ml

Xalacom^(I)(*Pfizer*) Eye Drops, Tk. 781.94/2.5 ml

Xalanol (*Beximco*),Eye Drops,Tk.495/2.5ml

TRAVOPROST

Indication: for controlling the progression of glaucoma

Cautions: allergic to any ingredient in travoprost drops, iritis, uveitis, narrow-angle and neovascular glaucoma

Side Effects: blurred vision, eyelid redness, darken eyelashes, eye discomfort, temporary burning

sensation during use , thickening of the eyelashes, restricting urine flow

Dose: same as that of latanoprost

Proprietary Preparations

Travoprost 0.004%.

Avatan (*Aristo*), Eye drops, Tk. 470/3 ml

Avost(*Ibn Sina*), Eye drops, Tk. 470/3 ml

Avro(*Drug Int*), Eye drops , Tk. 450/3 ml

Travast(*Incepta*), Eye drops ,Tk. 470/3 ml

Travoprost 0.004% +Timolol 0.5%

Avatan-T (*Aristo*), Eye drops, Tk. 500/3 ml

Travast Plus(*Incepta*),Eye drops, Tk.500/3ml

10. EYE

10.5 LOCAL ANAESTHETICS

Topical: Anaesthesia of the conjunctiva and cornea can be obtained very readily by the use of drops.

The most commonly used are short acting preparations such as **Lignocaine, Oxybuprocaine, Proparacaine and Proxymetacain.** These act within a few seconds and wear off within half an hour. They are adequate for such procedures as subtarsal or corneal foreign body removal, and application tonometry, lacrimal manipulation and irrigation.

Oxybuprocaine or a combined preparation of **lignocaine and fluorescein** is used for tonometry. Among other things **Proparacaine** is preferred to be used as excellent topical local anaesthetic for those ocular surgery which can be done under topical anaesthesia like cataract surgery.

Tablet 10.5 A : Comparison of Lignocaine & Bupivacaine regarding the concentration, onset and duration of action

Drug	Concentration/ Maximum dose	Onset of action	Duration of action
Lignocaine	1%-2% / 500mg	4-6 min	40-60min 120min (with adrenaline)
Bupivacaine	0.25%-0.75%	5-11min	480-720min (with adrenaline)

Side effects: are usually the result of excessively high blood concentration due to inadvertent intravascular injection, excessive dosage, rapid absorption or occasionally due to hypersensitivity, idiosyncrasy or diminished tolerance

CNS reactions include nervousness, dizziness, blurred vision and tremors, followed by drowsiness, convulsions, unconsciousness and possibly respiratory arrest.

Cardiovascular reactions are hypotension, myocardial depression, bradycardia and possibly cardiac arrest.

Amethocaine produces a more powerful and prolonged anesthesia and is suitable for use before minor surgical procedures, such as the removal of corneal sutures. It has a temporary disruptive effect on the corneal epithelium.

Proxymetacaine causes less initial stinging and is useful for children.

Regional anesthetics: Lignocaine, with or without adrenaline, is injected into the eyelids for minor surgery, while retrobulbar or peribulbar injections are used for surgery of the globe itself. The speed of onset and duration of action is increased by the addition of vasoconstrictor adrenaline and absorption into circulation from the site of injection is reduced. **Bupivacaine** has prolonged effect than lignocaine. So both is mixed before use if time of surgery is expected to be prolonged.

BUPIVACAINE INJECTION^[ED]

Proprietary Preparation
(see section 8.2)

OXYBUPROCAINE HCl

Proprietary Preparations

Buprocaine (*General*), Eye drops, 0.4%, Tk. 100/10 ml

Oxycaine (*Reman*) Eye drops, 0.4%, Tk. 50.43/10ml

Novocaine (*Opso Saline*), Eye drops, 0.4%, Tk. 31.7/10ml

PROPARACAINE

Indication: See notes above.

Side effects: See notes above.

Proprietary Preparation

P-caine (Popular), Eye drop. 0.5%, Tk.150/10 ml; Tk.125/5ml

Note. local anaesthetic should never be used for the management of ocular symptoms.

ROLE OF INJECTION OF HYALURONIDASE

Hyaluronidase is a spreading factor. It spreads the anaesthetic agent rapidly around the infiltrated area.

It is mixed with lignocaine. 1 vial containing 1500 IU added to a 30ml vial of lignocaine for local anaesthesia.

10.6 MISCELLANEOUS OPHTHALMIC PREPARATIONS

- 10.6.1 TEAR DEFICIENCY, OCULAR LUBRICANTS AND ASTRINGENTS
- 10.6.2 DIAGNOSTIC AND PERIOPERATIVE PREPARATIONS

10.6.1 TEAR DEFICIENCY, OCULAR LUBRICANTS AND ASTRINGENTS

Dry eye refers to a deficiency in either the aqueous or mucin components of the precorneal tear film. The most commonly encountered aqueous-deficient dry eye is keratoconjunctivitis sicca, while mucin-deficient dry eyes may be seen in cases of hypovitaminosis A, Stevens-Johnson syndrome, ocular pemphigoid, extensive trachoma and chemical burn. Some predisposing conditions should be kept in mind like- elderly age, postmanopausal women, patients with drugs like **anticholinergics, antimuscarinics, psychotropics, oral**

contraceptives etc, people in dry dusty environment, computer workers etc.

Chronic soreness of the eyes associated with reduced or abnormal tear secretion (e.g. in Sjogren's syndrome) often responds to tear replacement therapy. The severity of the condition and patient preference will often guide the choice of preparation.

Ocular lubricants are designed to correct deficiencies that may arise in the watery component, the mucus layer or the lipid layer of the tear film. Often more than one component is affected and it is a matter of trial to find which product suits the patient best.

Groups	Constituents
Cellulose derivatives	Hypromellose 0.5%
Polyvinyl alcohol	Polyvinyl alcohol 1.4%
Mucomimetics	Hypromellose 0.3% + Dextran 70

Hypromellose eye drops are the most commonly used tear substitutes and are of benefit when the watery component is deficient. It may need to be instilled frequently (e.g. hourly) for adequate relief. Ocular surface mucin is often abnormal in tear deficiency and the combination of hypromellose with a mucolytic such as **acetylcysteine** can be helpful.

Agents such as **polyvinyl alcohol, polyacrylic acid, povidone** and **dextran** help the aqueous layer spread over the hydrophobic corneal and conjunctival epithelium when the mucus layer is deficient and tear film distribution is patchy. **Polyvinyl alcohol** increases the persistence of the tear film and is useful when the ocular surface mucin is reduced. **Sodium chloride** eye drops (**0.9%**) may be used to irrigate the eye in lid disease that may be preventing secretion of the lipid layer by the meibomian glands. It can be used as 'comfort drops' by contact lens wearers, and to facilitate lens removal.

Eye ointments containing **paraffin** may be used to lubricate the eye surface, especially in cases of recurrent corneal

10. EYE

epithelial erosion. They may cause temporary visual disturbance and are best suited for application before sleep. Ointments should not be used during contact lens wear.

Zinc sulphate is a traditional astringent that is now little used. As it causes intense burning on application many prefer to restrict its use only for angular conjunctivitis.

CARBOXYMETHYL CELLULOSE SODIUM

Proprietary Preparations

Refreash Tears ^(Allergan), Eye drops, Tk. 0.05%, Tk. 255.71/10 ml, 1%, Tk. 504.70/10ml
Tearfresh Liquigel (General), Eye drops, 1% Tk. 250.00/10 ml

Carboxymethylcellulose Sodium 0.5% + Glycerin 0.9%

Neotear (Aristo), Eye drops, Tk. 190/10 ml

Carboxymethylcellulose Sodium 0.25% + Hypromellose 0.3%

Aqua (Opso Saline), Eye drops, Tk. 142.86/10ml
Lubric Extra (Incepta), Eye drops, Tk. 150/10ml

CYCLOSPORINE

Indication: to increase tear production in patients whose tear production is presumed to be suppressed due to ocular inflammation associated with dry eye syndrome

Side-effects: ocular burning, conjunctival hyperemia, discharge, epiphora, eye pain, foreign body sensation,

Dose: 0.05% twice a day

Proprietary Preparations

Cyporin (Aristo), Eye drops, 0.05%, Tk. 210.00/5 ml
Cyclorin (Ibn Sina), Eye drops, 0.05%, Tk. 210.00/5 ml

HYPERTONIC SODIUM

5% NaCl ophthalmic preparation for decreasing corneal (epithelial) odema
1 drop 4-6 times a day

Proprietary Preparations

I-Sol (Opso Saline), Eye drops, 5%, Tk. 70/10 ml
NCL (Aristo), Eye drops, 0.9%, Tk. 70/5 ml
Norsol (Opso Saline), Eye lotion, 0.9%, Tk. 25.00/25 ml
N-Sol (Popular), Eye drops, 0.9%, Tk. 20/5 ml
Saloride (Beximco), Eye drops 0.9%, Tk. 60/10 ml

HYPROMELLOSE

Proprietary Preparations

Atier ED (ACI), Eye drops, 0.3%, Tk. 65.25/10 ml
Eye (Opso Saline), Eye Gel, 0.2% , Tk. 90.56/3 ml
Eyefresh (Opso Saline), Eye drops, 0.3%, Tk. 52.83/10 ml
G-Hypromellose (Gonosshasthaya), Eye drops, 0.3%, Tk. 55.00/10 ml
Hypersol (Beximco), Eye drops, 0.3%, Tk. 70/10 ml
Hypomer (Aristo), Eye Gel, 0.3%, Tk. 250/10 gm
Hypro (Nipa), Eye drops, 0.3%, Tk. 80/5 ml
Iclear (Navana), Eye drops, 0.3%, Tk. 70.00/10 ml
Lubric (Incepta), Eye drops, 0.5%, Tk. 80.00/10 ml
Ocutear (Asiatic), Eye drops, 0.3%, Tk. 65.00/10 ml
Optagel (Popular), Eye Gel, 0.2%, Tk. 120.45/3 ml Prefilled syringe

Dextran 70 1% + Hypromellose 0.3%,
Glamor (Ibn Sina), Eye drops, Tk. 90/10 ml
Lacrima (Opsonin), Eye drops, Tk. 52.63/10 ml
Lubtear (Square), Eye drops, Tk. 90/10 ml
Optafresh (Apex), Eye drops, Tk. 80/10 ml
Syntar (Drug Int.), Eye drops Tk. 90/10 ml

POLYVINYL ALCOHOL

Proprietary Preparations

Liquifilm Tear ^(Allergen), Eye drops, 1.4%, Tk. 173.46/15 ml

POLYETHYLENE GLYCOL 0.4% + PROPYLENE GLYCOL 0.3%

Proprietary Preparations

Autotear (Popular), Eye Drops, Tk. 150.57/10ml
Filtear (Incepta), Eye Drops, Tk. 150/10 ml
Freshtear (Eskayef), Eye drops, Tk. 150/10ml
Glytea (General), Eye Drops, Tk. 150/10 ml
Oculant (Square), Eye Drops, Tk. 150/10 ml
Polygel (Ibn Sina), Eye Drops, Tk. 150/10 ml

Polysol (*Apex*), Eye Drops, Tk. 150/10 ml
Syskem (*Kemiko*), Eye Drops, Tk.150/10 ml
Systear (*Aristo*), Eye drops, Tk. 150/10 ml
Tearon (*Beximco*), Eye Drop, Tk. 150/10 ml

POVIDONE

Proprietary Preparations

Artear (*Popular*), Eye drops, 5%, Tk.90/10 ml
Bludrop (*Healthcare*), Eye drops 5%, Tk. 100/10 ml
Eyerin (*Opso Saline*), Eye drops, 5%, Tk. 67.67/10 ml
Optear (*Ibn Sina*), Eye drops,5%,Tk.90/10 ml
Optirex (*Jayson*), Eye drops, 5%,Tk. 80.30/10ml
Povilect (*Kemiko*), Eye drops, 5%, Tk.90/10ml
Povin (*Opsonin*), Eye drops,5%,Tk. 67.67/10ml
Protear (*Aristo*), Eye drops, 5%,Tk. 90/10ml
Rovidone (*ACI*), Eye drops, 5%, Tk.80.30/10ml
Solotear (*Asiatic*), Eye drops, 5%, Tk. 90/10ml
Tearex (*Beximco*), Eye drop, 5%, Tk. 85/10ml
Teargen (*General*), Eye drops, 5%, Tk.90.00/10 ml

10.6.2 DIAGNOSTIC AND PERIOPERATIVE PREPARATIONS

DIAGNOSTIC

Stains are used in diagnostic procedures and for locating damaged areas of the cornea and conjunctiva due to diseases or injury. Fluorescein and rose bengal are water-soluble dyes that are taken up by hydrophilic or water-containing substances such as the tear film, damaged epithelial cells (healthy epithelial cells being hydrophobic) and corneal stroma. Both can be viewed directly, and the appropriate interpretation can be made of take up of the yellow or red dye. Corneal abrasions, ulcers (particularly the branching dendritic ulcer of herpes simplex), and keratoconjunctivitis can be diagnosed with ease.

Fluorescein applied primarily as a 2% alkaline solution, and with impregnated paper strips, is used to examine the integrity of the conjunctival and corneal epithelia. Defects in the corneal epithelium will appear bright green in ordinary light & bright yellow when a cobalt blue filter is used in the light path.

Similar lesion in conjunctiva appears bright orange-yellow in ordinary illumination.

Fluorescein is also used for checking fitness of rigid contact lens, though it cannot be used for soft lenses, which absorbs the dye.

In addition **fluorescein** is used for performing applanation tonometry and one test of lacrimal apparatus patency (Jones test).

Rose Bengal is much more efficient for the diagnosis of conjunctival epithelial damage but it stings excessively unless a local anaesthetic is instilled beforehand. Devitalized cells stain bright red, while normal cells shows no change.

As chances of growth of fungus inside the container of the dye is higher, it is unwise to use it for prolong period. It is best to use the dye impregnated paper strips.

FLUORESCEIN SODIUM^[ED]

Proprietary Preparation

Flurocin (*Reman*), Eye drop 2%, Tk.34/4ml

OCULAR PERIOPERATIVE DRUGS

These are discussed in the heading of injections that are used intracamerally (inside the eye), irrigating solutions that is used both externally and intracamerally.

INTRACAMERAL INJECTIONS

It must be preservative free. The only established indication for this route is the administration of antibiotics in the treatment of endophthalmitis, only minute amounts of antibiotic are tolerated within the eye. Through this route xylocaine and miotics may be used.

Miotics

Acetylcholine chloride 1%
 Pilocarpine nitrate 0.5% (*see also sec 10.4.3*)

Mydriatic

10. EYE

Adrenaline injection (1 in 1000) is diluted with 500ml BSS/ Ringer solution to make and maintain the pupil dilated during surgery. It is contraindicated in ischaemic heart disease.

Irrigating Solutions

Balanced salt solution (BSS): Most friendly irrigating solution for intracameral manoeuvre causing no untoward effect on corneal endothelium.

COMPOSITION: sodium chloride 0.64%, sodium acetate 0.39%, sodium citrate 0.17%, calcium chloride 0.048%, magnesium chloride 0.03%, potassium chloride 0.075%.

BSS plus solution has 3 additional constituents for corneal endothelium (sodium bicarbonate, dextrose, oxidized glutathione)

Ringer's solution though not comparable to BSS solution (composition in 1000ml: NaCl-8.6g, KCl-0.3g, and CaCl₂-0.33g) it can be used when BSS solution is not found and is not affordable by the patient.

Presentation: 15ml, 250ml, 500ml

Proprietary Preparations

Balanced salt solution :

Navsol (*Beximco*), Tk. 250/500ml

Opso-Rinse (*Opso Saline*), Tk.35.13/100ml

VISCOELASTIC SUBSTANCES

Hydroxypropylmethylcellulose (HPMC): Most widely used in our country as it cheap and plenty available.

It has good coating ability but less retentive capacity. It can be autoclaved.

Sodium hyaluronate 1% (Healon) (10mg/ml): It has very good retentive capability but meticulous removal before finishing surgery is strongly indicated otherwise chances of increased IOP is more. It is very costly which makes its use limited.

Proprietary Preparations

Hyalgun (*Healthcare*), Inj.,(P.F syringe) 20 mg/2 ml, Tk. 1,980.00/ Syringe

Hyloron (*Aristo*), Eye drops, 0.2%, Tk. 270.00/10 ml ; 0.1%, Tk. 220.00/10 ml

Hyronate (*Incepta*), Inj., (Prefilled Syringe) 20mg/2 ml, Tk.1,500.00/Syringe

OTHER PERIOPERATIVE PREPARATIONS

Apraclonidine 1% for prevention or control of postoperative of IOP.

NSAIDs: Used for maintenance of the mydriasis during surgery and for control of postoperative inflammation as stated in section10.3

10.7 CONTACT LENSES

Contact lenses are increasingly gaining popularity in our country.

Indications: COSMETIC: Most people specially the young females use it for cosmetic reasons. They prefer it to the spectacles.

MEDICAL: There are also its therapeutic uses

Types in use:

1. Rigid (hard or gas permeable)
2. Soft (hydrogel) lens the most popular type.

Though rapidly gaining popularity it's use might decline in the long run for the vision threatening complications resulting from:

1. Improper cleaning and disinfection of the contact lens
2. Improper use of contact lens like using for prolonged period of the day than prescribed, using while sleeping etc. The advent of Lasik Surgery for the correction of refractive errors will also result in the decline of the popularity of contact lens.

Complications include ulcerative keratitis (specially acanthamoebia keratitis resulting from ineffective lens cleaning and disinfection), conjunctival problems (purulent or papillary conjunctivitis).

Note. It is the duty of the ophthalmologists (as there is great paucity of optometrist in Bangladesh) to make the user well aware of the complications and to instruct them to

10. EYE

visit them for checking whether they are cleaning and disinfecting regularly.

Prescribing eye medications for contact lens users:

Some drugs and preservatives in eye preparations accumulate in the soft lens and may induce toxic reactions. Contact lens users are instructed to remove soft lens before instillation and advised not to wear them during the period of treatment. Ointments can not be used in conjunction of contact lens wear.

Adverse effects of some systemic drugs on contact lens:

1. Oral contraceptives (with high oestrogen content)
2. Those reduce blink rate: anxiolytics, hypnotics, antihistamines, muscle relaxants.
3. Those reduce tear production: antihistamines, antimuscarinics, phenothiazines, some beta-blockers, diuretics, and tricyclic antidepressants.
4. Those increase lacrimation: ephedrine, hydralazine
5. Others: aspirin (absorbed by contact lens leading to irritation), rifampicine and sulphasalazines (may discolor the lens).

Adenosine 0.2% + Cytochrome C 0.05% + Sodium Succinate 0.6% + Nicotinamide 1.0%

Indications: eye drops is used for the treatment of lens opacification.

Proprietary Preparations

Catnil (*Acme*), Eye Drops, Tk. 125/5 ml

Catrix (*Incepta*), Eye Drops, Tk. 125/5 ml

Phacovit (*Aristo*), Eye Drops, Tk. 125/5 ml

Ractovit (*Ibn Sina*), Eye Drops, Tk. 125/5 ml

Vitafol (*Popular*), Eye Drops, Tk. 125/5 ml

Vitalens (*General*), Eye Drops, Tk. 120/5 ml