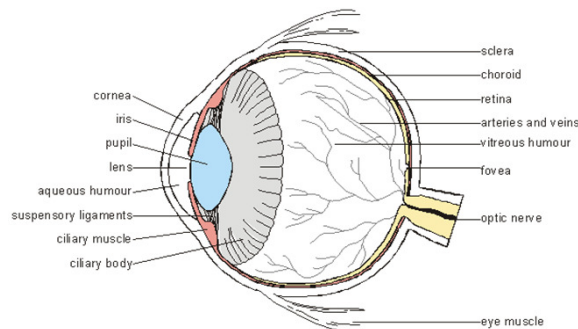


Ophthalmology

Dr K Outhoff



Some thoughts

- Eye provides unique opportunity to monitor the effects of drugs, esp. those that act on the ANS
- Tears drain into the nose which is lined with vascular endothelium
- This permits direct access of absorbed drugs to systemic circulation
- Lack of first pass metabolism may thus lead to unwanted systemic side effects
- Most ophthalmic drugs are delivered as drops

Contents

1. Hordeolum
2. Blepharitis
3. Bacterial keratitis
4. Conjunctivitis
5. H. Simplex keratitis
6. Dry Eye Syndrome
7. Vit. A deficiency
8. Open angle glaucoma
9. Closed angle glaucoma
10. Mydriatics
11. Local Anaesthetics
12. Iatrogenic eye disease



A. Anti-infective Eye preparations

1. Antibacterials
2. Antifungals
3. Antivirals

1. Antibacterial therapy

Superficial eye infections (conjunctivitis, blepharitis):

- Topical antibiotic eg chloramphenicol

Corneal infections (keratitis):

- MC+S
- Topical fluoroquinolone initial empiric Rx

Intraocular infection (endophthalmitis):

- Refer for iv cephalosporin (3rd) or intravitreal (ceftazidime + vancomycin) antibiotics

1. Topical antibacterials for superficial eye infections

First line:

- Chloramphenicol (broad spectrum): effective in > 90%

Second line:

- Fluoroquinolones: ciprofloxacin, ofloxacin, norfloxacin
- Aminoglycosides: Framycetin, Tobramycin, Neomycin(+pseudomonas)
- Fusidic acid (+ Staph)
- Bacitracin (in combination with neomycin)
- Polymixin B (in combination with others)
- Sulphacetamide and propamidine

Chloramphenicol:

conjunctivitis, blepharitis, uveitis,
corneitis, bacterial keratitis

- Broad spectrum
- Gram positives, gram negatives
- Chlamydia, Mycoplasma, Spirochaetes

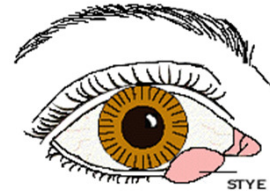
Low ocular toxicity
Excellent penetration

Occ. optic neuropathies
Aplastic anaemia with prolonged use

1. Hordeolum externum (Styes)

- Abscesses of hair follicles
- Rx: local antibiotic ointment

- chloramphenicol

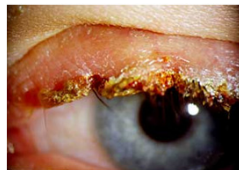


2. Blepharitis

- Inflammation of eyelids due to local infection
- Staphylococcus

Rx:

- Regular saline bathing
- Topical chloramphenicol



3. Bacterial keratitis

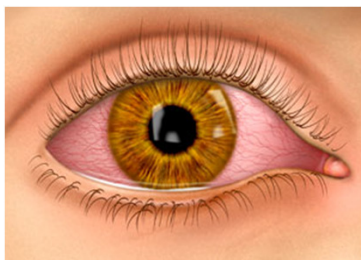
- Chloramphenicol ointment



Figure 2

4. Bacterial Conjunctivitis

- Chloramphenicol ointment



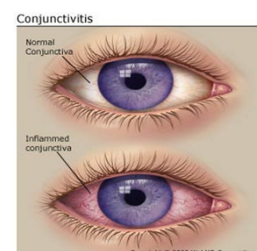
4. Allergic Conjunctivitis

Topical mast cell stabilisers:

- Sodium cromoglycate daily
- Lodoxamide

Antihistamine drops:

- Emedastine
- Levocabastine
- Olopatadine



Sodium cromoglycate drops / ointment

- Anti allergic
- Anti-inflammatory
- Long-term prophylaxis
- Inhibit mast cell release of histamine, SRS-A, chemotactic factors
- Well tolerated

2. Antifungals for fungal infections such as keratitis

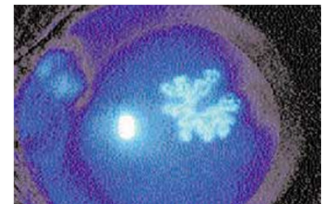
- Natamycin drops
- Polyenes
 - Polymixin B Sulphate (topical)
- Imidazoles (topical and intravitreal)
 - Clotrimazole
 - Miconazole
- Propamidine Isetionate
- Pyrimidines (topical)
 - Flucytosine

3. Antivirals

- **Herpes Simplex:** acute herpetic keratitis, dendritic corneal ulcers:
 - Aciclovir topical
- **Herpes zoster ophthalmicus:**
 - Aciclovir oral / intravenous
- **CMV retinitis:**
 - Ganciclovir intravenous / intravitreal

5. H. Simplex keratitis

- Dendritic ulcers in cornea
- Photophobia and epiphoria
- No steroids: massive amoeboid ulceration
- **Aciclovir** ointment



Aciclovir Ointment for HSVI and HSVII

- Penetration sufficient for aqueous humour
- Converted to active compound inside herpes-infected cells
- Transient stinging
- Reversible punctate keratopathy

6. Dry eye syndrome keratoconjunctivitis sicca

- | | |
|---|---|
| <ul style="list-style-type: none"> • Decreased tear production by lacrimal glands <ul style="list-style-type: none"> – Sjogren's – Mumps – Sarcoid – Amyloid – Lymphoma – Leukaemia – Haemochromatosis – Old age – Atropine – Diuretics | <ul style="list-style-type: none"> • Excess evaporation
Post-exposure keratitis • Mucin deficiency
Avitaminosis A
Stevens-Johnson's
Pemphigoid
Chemical burns |
| Rx: <ul style="list-style-type: none"> • Underlying cause • Artificial tears | |

7. Vit A deficiency Xerophthalmia and Keratomalacia

Night blindness

Dryness of conjunctiva –xerosis

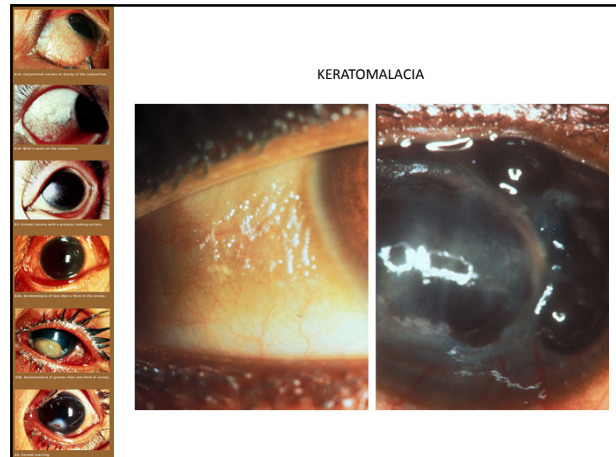
Bitot's spot

- Reversible with Vit. A

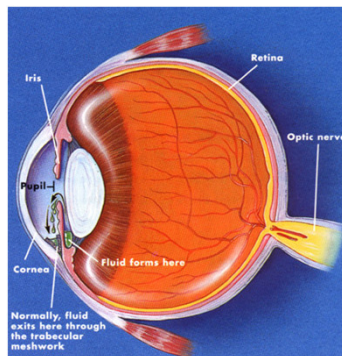
Corneal xerosis, ulceration, perforation

Keratomalacia massive softening of cornea, extrusion of intraocular contents

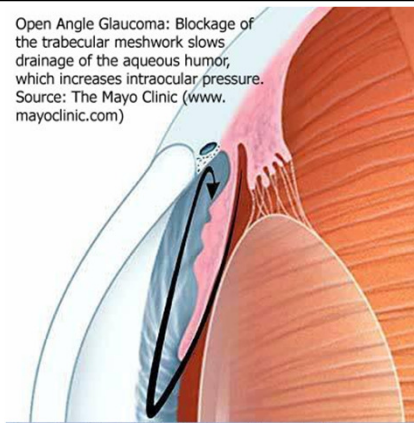
- Retinol palmitate (Vit. A) for 6 days, then daily until eyes normal



8. Chronic Open Angle glaucoma



Open Angle Glaucoma: Blockage of the trabecular meshwork slows drainage of the aqueous humor, which increases intraocular pressure. Source: The Mayo Clinic (www.mayoclinic.com)



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8. Chronic Open Angle Glaucoma

- Rise in intraocular pressure, ie. ocular hypertension
- Cupping of optic discs
- Defects of visual fields
- Blindness
- Progressive
- Irreversible

Principles of treatment

- Goal of therapy is to preserve patient's visual function
- Early detection vital
- The most reliable therapy is reduction of intraocular pressure (IOP)
- Address all factors causing elevation of IOP
 - Pupillary block: peripheral iridotomy
 - Uveitis: anti-inflammatory Rx
 - Neovascular glaucoma: photocoagulation
 - Steroid glaucoma: discontinuation of steroids
- Rx Options:
 - Drugs
 - Laser
 - Invasive surgery
- Achieve maximum effect with minimum drugs

Glaucoma treatment agents

First line

- Prostaglandin analogues
- Beta blockers
 - β_1 selective
 - Non-selective

Second line

- Carbonic anhydrase inhibitors
 - Topical
 - Systemic (acute)
- Sympathomimetics (adrenergic agonists)
 - α_2 -selective
 - non-selective
- α_1 -blockers
- Hyperosmotics (mannitol) (acute)
- Parasympathomimetics (acute)
- \emptyset trabeculectomy, trabeculoplasty

New NICE guidelines April 2009 Mx of chronic open angle glaucoma

Drugs mentioned:

1. Prostaglandin analogues
2. Beta blockers
3. Carbonic anhydrase inhibitor (topical)
4. Adrenergic agonists (brimonidine)

1. Prostaglandin analogues: latanoprost, bimatoprost, travoprost

- Selective prostaglandin F2 agonists
- Reduce IOP by increasing aqueous outflow via uveoscleral outflow route
- Most potent ocular hypotensives
- Reduce IOP by 25-35%
- Considered first line where cost not an issue
- Applied topically as drops
- Prodrugs, which become active (metabolised) in eye

2. Beta-blockers: eye drops

- Reduce aqueous production

Non-selective (drops) reduce pressure by 20-35%:

- Timolol
- Levobunolol
- Metipranolol
- Carteolol

Selective: not as efficacious, but safer in asthmatics:

- Betaxolol

B-blockers general profile:

- Airways: broncho-constriction
 - c/i Asthma
- Heart: \downarrow rate \downarrow force
 - c/i Cardiac failure, sinus bradycardia, A-V block
- Interactions: other β -blockers, Ca^{++} antagonists
- s/e: dizziness, headache, depression, bradycardia, hypotension, bronchospasm, myasthenia gravis

3. Carbonic anhydrase inhibitors

- Topical
 - (used alone or in conjunction with beta-blockers)
 - Dorzolamide
 - Brinzolamide
- Systemic
 - (many side effects preclude long-term use; for acute glaucoma only)
 - Acetazolamide
- Reduce IOP by reducing rate of aqueous inflow by as much as 50% if given orally or intravenously (acute closed angle)

4. Adrenergic agonists

Reduce aqueous humour production
Increase uveoscleral outflow

α -2 selective agonist:

- Brimonidine
(for chronic use)
- Apraclonidine
prevents transient elevation of IOP following laser surgery

Non-selective (α -1/ α -2) agonist:

- Adrenaline drops

α -1 blockers

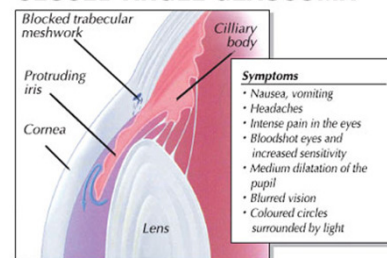
- Increase uveoscleral outflow
- Bunazosin

Parasympathomimetics

- Increase aqueous outflow via Schlemm's canal:
 - Contraction of ciliary muscle
 - Constriction of pupil (miotic)
- Pilocarpine
Used to be the mainstay of chronic treatment;
now largely superseded

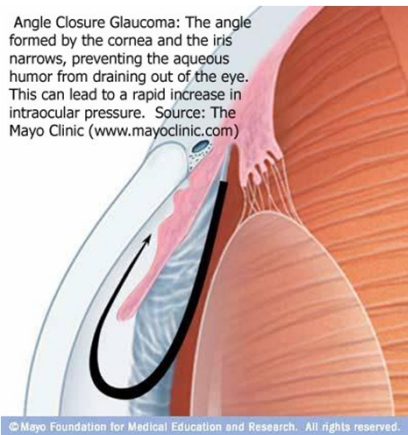
Used in closed angle glaucoma

CLOSED ANGLE GLAUCOMA



The angle between the iris and the cornea narrows or closes, blocking the drainage of the aqueous humor.

Angle Closure Glaucoma: The angle formed by the cornea and the iris narrows, preventing the aqueous humor from draining out of the eye. This can lead to a rapid increase in intraocular pressure. Source: The Mayo Clinic (www.mayoclinic.com)



9. Acute closed angle glaucoma: medical emergency

- Shallow anterior chamber predisposes
- Blockage of drainage of aqueous humour from anterior chamber via canal of Schlemm.
- Dilatation of pupils and night exacerbate drainage block
- Intraocular pressure rises
- Pupil fixed, dilated, ovoid

Acute closed angle glaucoma

Mydriatic (dilate pupils) drugs may precipitate acute glaucoma:

- Anticholinergics:
 - Atropine
 - Tropicamide
 - Cyclopentolate
 - Homatropine,
 - Hyoscine
 - Other anticholinergic drugs (TCA, antipsychotics, antihistamines)
- Sympathomimetics:
 - Adrenaline
 - Other sympathomimetics (phenylephrine, etc)

Treatment: acute glaucoma

Ø: Peripheral iridectomy: definitive treatment

Drugs for transitional period:

1. Parasympathomimetic: Pilocarpine drops:
 - cholinergic agonist
 - causes miosis, opens drainage angle
 - causes ciliary muscle contraction, opens canal
2. Systemic carbonic anhydrase inhibitor: Acetazolamide (oral or iv)
 - reduces aqueous formation
3. Hyperosmotic agents: Glycerin or mannitol

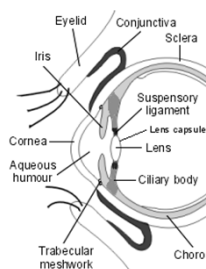
Pilocarpine

1. Constriction of Pupil (Miosis)

- pulls iris out of angle of eye
- increases aqueous drainage through trabecular meshwork

2. Contraction of ciliary muscle

- relaxation of suspensory ligament
- lens rounded for near vision
- opens canal of Schlemm



Pilocarpine drops ↑ACh

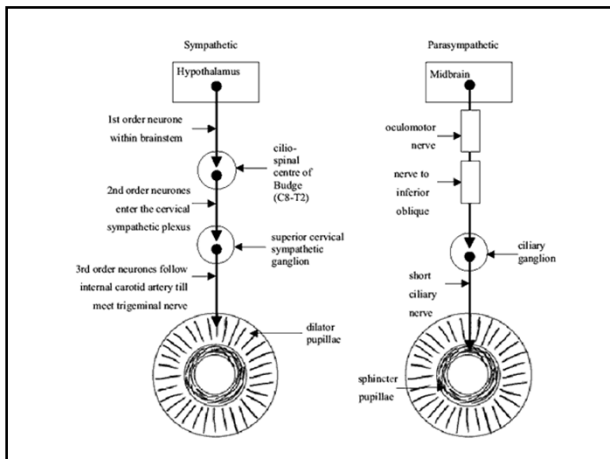
- Cholinergic agonist
- Contraindicated in glaucoma associated with inflammatory process
- Posterior synechiae may be formed
- Side effects from systemic absorption infrequent:
 - Nausea, vomiting, diarrhoea, salivation

Oral Acetazolamide (Diamox)

- Carbonic anhydrase inhibitor: diuretic
- Drug interactions:
 - ↑hypokalaemia : other diuretics: thiazide, loop
 - : corticosteroids
 - : amphotericin B
- ↓renal elimination: quinidine
- procaïnamide
- TCA's
- ↑renal elimination: Lithium
- Malaise, anorexia, loss of libido, nervousness, depression, metallic taste in mouth, paraesthesias, gout
- Haematuria, renal calculi, bone marrow suppression, hepatic coma in cirrhosis

Osmotic agents

- Decrease vitreous volume
- For short term, pre-operative treatment of acute closed-angle glaucoma
- Glycerin (oral)
- Mannitol (iv)



10. Mydriatics and Cycloplegics

- Anticholinergics and sympathomimetics
- Uses:
 - Detailed examination of fundus
 - Anterior uveitis (prevent posterior synechiae)
 - Pain relief

10. Mydriatics - Anticholinergics(↓ Ach)

1. Dilate the pupil
 2. Cycloplegia → blurred vision
- Tropicamide, (short acting)
 - Cyclopentolate (preferred for cycloplegia)
 - Homatropine,
 - Hyoscine
 - **Atropine: (preferred for cycloplegia)**
 - Prevents synechiae in iritis
 - Pain relief post injury
 - May precipitate acute glaucoma

Mydriatics dilate the pupil.
Sympathomimetics (↑adrenaline)

- Pupil dilatation
- Insignificant cycloplegia
- Phenylephrine: α -stimulant
- Ephedrine: α and β receptors

11. Local anaesthetics

examination, minor optical procedures

Ester type:

- Oxybuprocaine, less irritating than tetracaine
- Tetracaine (amethocaine,) more potent, longer duration of action

Amide type:

- Lignocaine - with adrenaline for Ø

- Chemical toxicity causes transient corneal lesions
- Systemic toxicity: CNS ↑ or ↓, sweating, arrhythmias, muscle twitching
- Rare: allergy

B. Corticosteroids and other anti-inflammatories

- To be used by specialist only.
 - Uveitis
 - Scleritis
 - Post-op
 - Local: drops, ointment, subconjunctival injection
 - Oral
- Types: Betamethasone, dexamethasone, hydrocortisone
- AEs:
- Thinning cornea, sclera
 - Adrenal suppression
 - Herpes aggravation
 - Steroid glaucoma
 - Steroid cataract

12. Iatrogenic eye disease

- Steroids:
 - Herpes dendritic ulcer progression, blindness
 - precipitate glaucoma
 - cataracts
- Mydriatics including anticholinergics: antidepressants, antiparkinsonian, antipsychotics, etc:
 - precipitate glaucoma
- Ethambutol:
 - retinal effects, retrobulbar neuritis
- Chloroquine:
 - retinal damage
- Vigabatrin:
 - Visual field defects

Stevens-Johnson syndrome often involves the eye

