



Pharmacology of the eye

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Barriers to drug delivery

- Compliance
 - Poor technique
 - Short residence time
 - Wash out from tears
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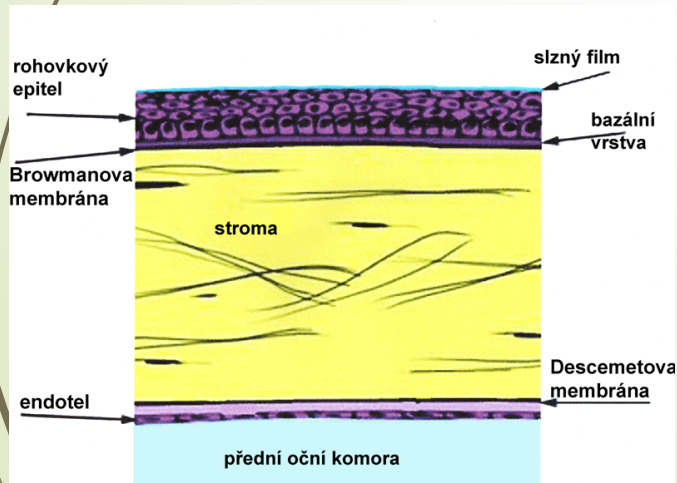
Compliance

- Physical barrier: poor vision, arthritic fingers, severe kyphosis
- Cognitive: decline, poor memory
- Range of aides: memoire, gadget



Local drug effectiveness

- Drug design: pH, solubility, molecular size will affect drug passage crossing cornea- it must be water and lipid soluble
- More viscous may be retained longer
- Toxicity: keratopathy punctata





Ways of administration

- Topically- drops or ointment
- Periocular injection- subconjunctival, subtennons
- Intravitreal injection: antiVGF, antibiotics, corticosteroids,
- Oral and intravenous dosing: antibiotics, corticosteroids, antivirals, antimetabolites, diuretics

Application of drops



Application of ointment



Application with glass stick



Rinse out



Retrobulbar injection



Bandage with safety shell



Bandage



Bandage



Wet chamber






Drugs



- Ophthalmic Dyes
- Anesthetic agent
- Dilating agents
- Lubricants
- Hyper osmotic agents
- Anti allergy medications
- Anti-infective agents
- Immunosuppressive agents
- Glaucoma agents



Ophthalmic Dyes

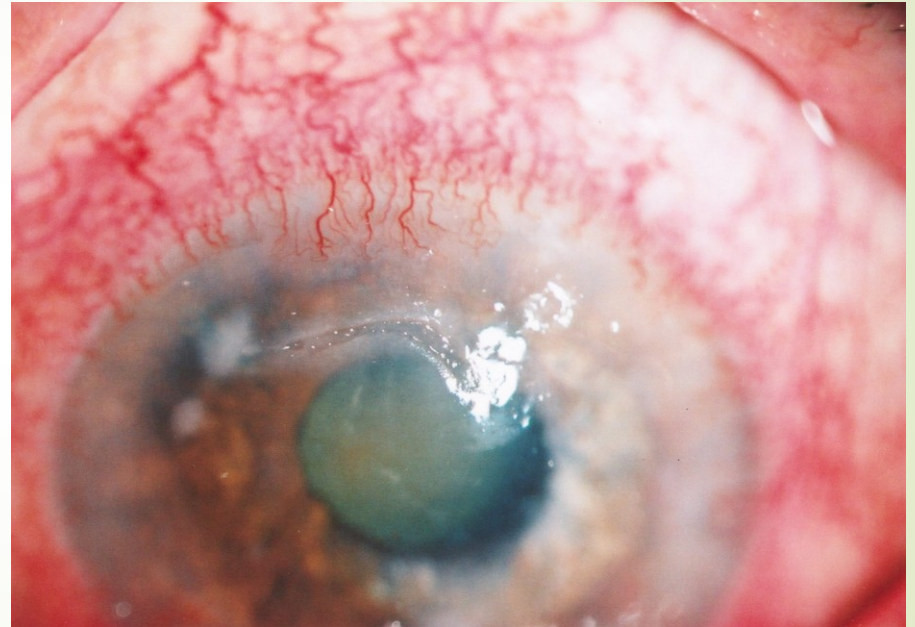
- ▶ Fluorescein- stain epithelial defect, will not stain devitalized cell, stain soft contact lens, promote growth of Pseudomonas Aeruginosa, angiography
 - ▶ Lissamine green-dry eye evaluation
 - ▶ Rose bengal-stain devitalized cells, mucin
 - ▶ Indocyanine green-angiography
 - ▶ Trypan blue-stain lens capsula, epiretinal membrane
- 



Comparative staining

	Epithelial defect	Devitalized cells	Mucin
Fluorescein	++	0	+
Rose bengal	0	++	++
Lissamine green	0	++	+

Ulcus corneae



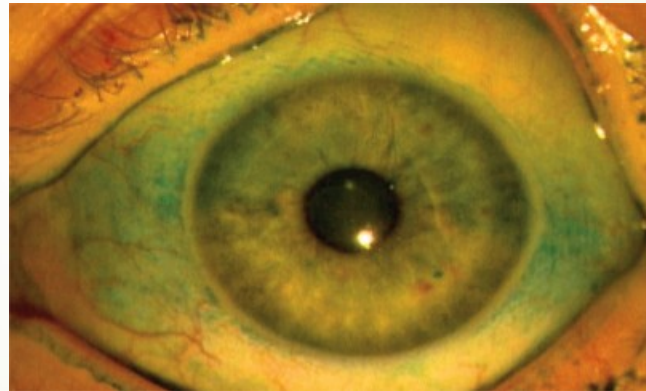
Fluorescein staining

Bengal Rose staining



Dry eye

Lyssamine green stain



Dead cells




Anesthetics agents

- Tetracain 0,5% - corneal or conjunctival foreign body, photoelectric ophthalmia, intraocular surgery
- Topical, intracameral, subconjunctival, subtenons, parabolbar




Dilating drugs (mydriatics)



	Max. mydriasis	Duration
Parasympatholytics		
Tropicamide 0,5%	20-40 min.	4-8 hours
Cyclopentolate 0,5%	30-60 min.	12-24 hours
Homatropine 1%	40-60 min.	24 – 72 hours
Scopolamine 0,25%	20-30 min.	3-7 days
Atropine 1%	30-40 min.	7-10 days
Sympathomimetics		
Phenylephrine 2%	20-30 min.	4-6 hours
Hydroxyamphetamine	25-35 min.	4-6 hours

Cataract





Indication for cycloplegic refraction

- Strabismus
- Amblyopia
- Anisometropia
- Pseudomyopia
- Hyperopia with esophoria or lag of accommodation
- Unstable end point on static retinoscopy
- Uncooperative child




Efficiency of cycloplegics

- 1% atropin 100%
- 1% cyclopentolate 92%
- 1% tropicamide 80%
- 5% homatropine 54%





Ocular Side effect

- ▶ Allergic Contact dermatitis
 - ▶ Angle-closure glaucoma
 - ▶ Elevation of IOP with open angles
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Systemic side effect of atropine

- ▶ Tachycardia, dry mouth mydriasis, confusion, decreased GI motility, ataxia, hallucination, convulsion, coma
- 




New treatment modality of myopia

- ▶ 0,01% atropin drops




Ophthalmic lubricants

- Hydroxyethylcellulose
 - Polyvinyl alcohol 1,4 – 3%
 - Dextran 70%
 - Hydroxypropylmethylcellulose 0,5 – 1%
 - Carboxymethylcellulose
- 



Ophthalmic lubricants

- Povidone
 - Glycerine 1%
 - Polysorbate 1%
 - Polyethylen glycol 0,4%
 - Propylene glycol 0,3%
- 



Preservative in Ophthalmic Lubricants

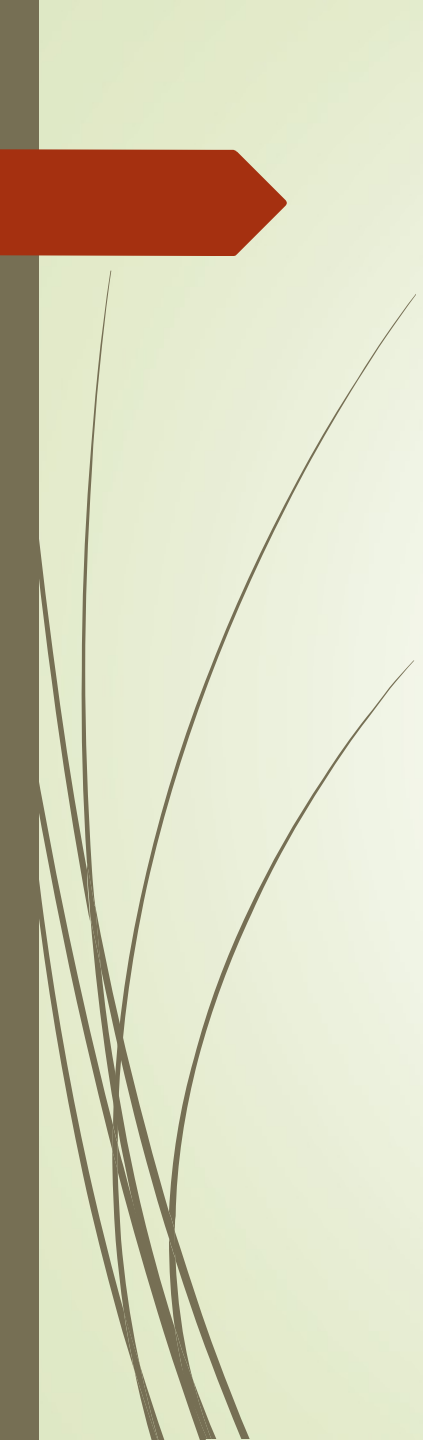
- Thiomersal
 - EDTA
 - Chlorobutanol
 - Benzalkonium chloride
 - Chlorobutanol
 - Methylparaben
 - Purite
 - Polyquaternium-1
 - None
- 





Dry eye questionnaire



1. Have you ever had drops for dry eye?
2. Do you ever experience of the following eye symptoms?
 - a. Soreness, scratchiness, dryness, grittiness, burning
3. How often do you have these symptoms?
4. Do you regard your eye as being sensitive to smoke, smog, air condition?

- 
5. do you take antihistaminic, diuretics, sleeping tablets, tranquilizers , stomach medicine, high pressure medicines?
 6. Do you have arthritis?
 7. Are your joint fingers swollen in the morning?
 8. Do you have dryness of the nose, mouth or dry cough?

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9. Do you have thyroid abnormality?
 10. Do you ever awaken with eye irritation or excessive dried mucus in the corners of you eye?



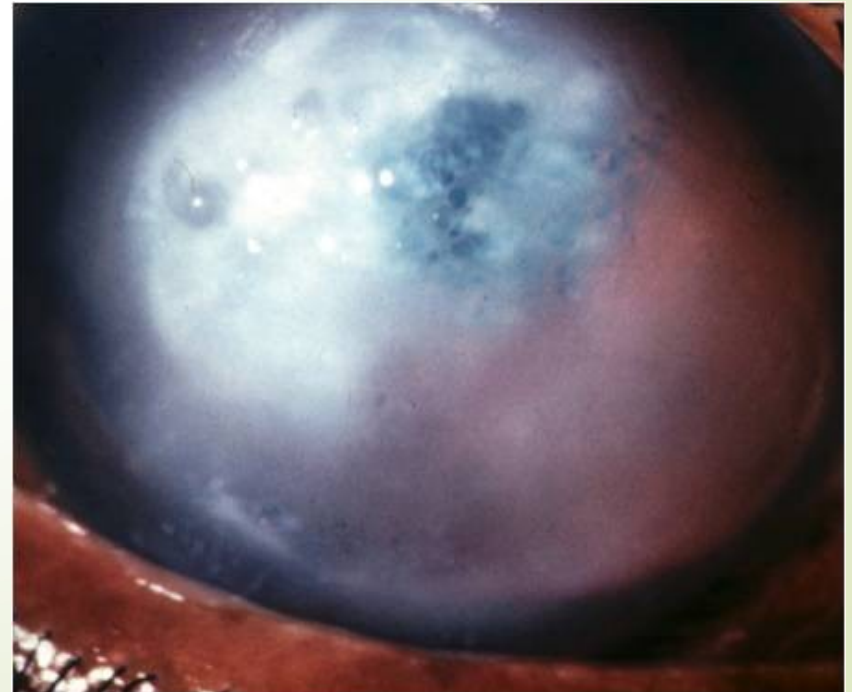
Medicaments that can affect tear quality

- Antibiotics (tetracycline)
- Antihypertensive
- Botulotoxin
- Dermatologicals (isotretinoin)
- Psychomimetics (diazepam, thioridazine)
- Topical betablockers
- Antihistamines
- Diuretics
- Long term antiperspirants

Topical hyperosmotic agents

- 2-5% NaCl solution
- 40% glucose solution
- 5% NaCl ointment
- 40% glucose ointment

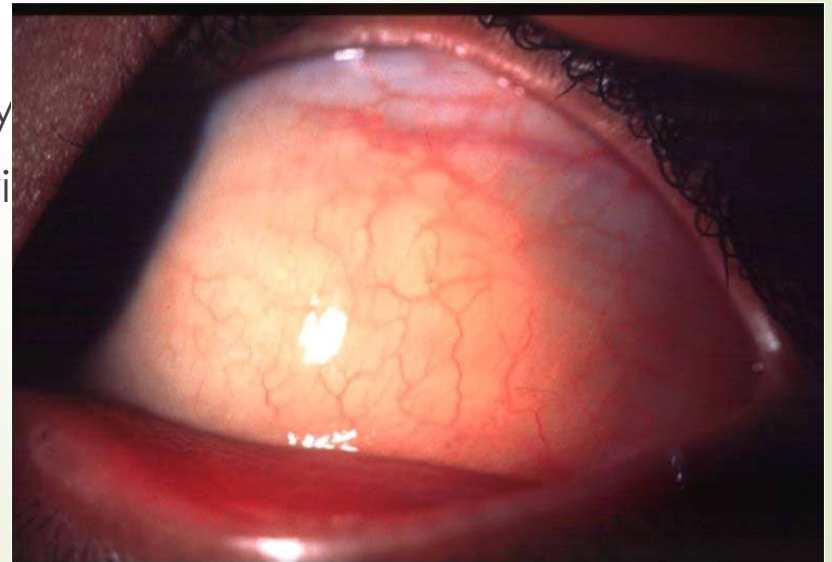
Bulous keratopathy



Anti-allergy medication


- Topical
 - Decongestants
 - Antihistamines
- Systemic antihistamines
 - Sedative effects
 - Antihistamine activity
 - Anticholinergic activity

Allergic conjunctivitis





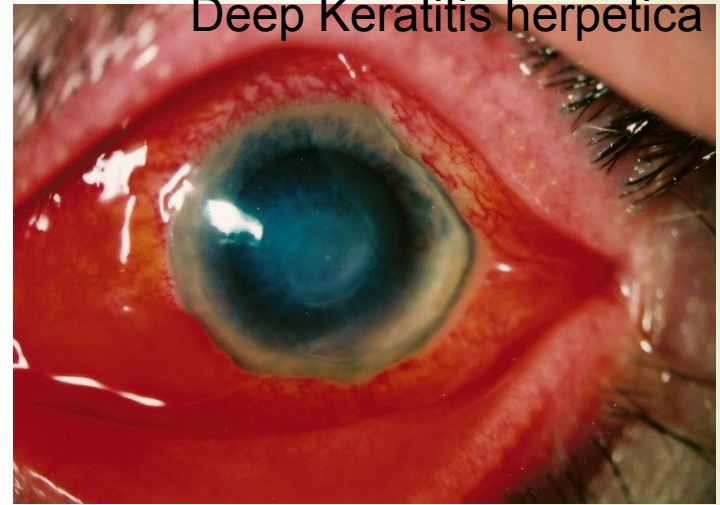
Anti-infective agents

- Antibiotics
 - Virostatics
 - Antimycotics
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Endofoalmitis mycotica



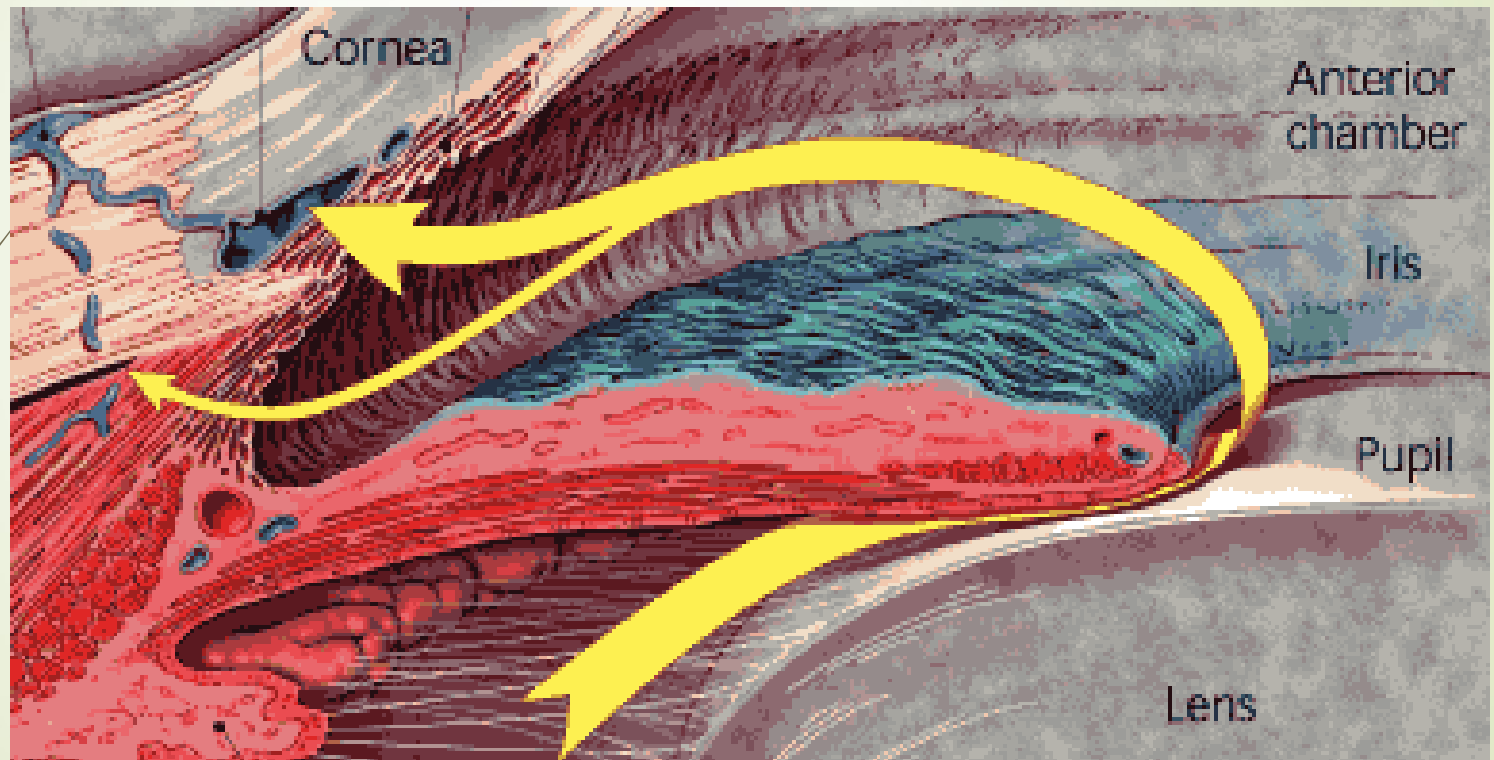
Deep Keratitis herpetica



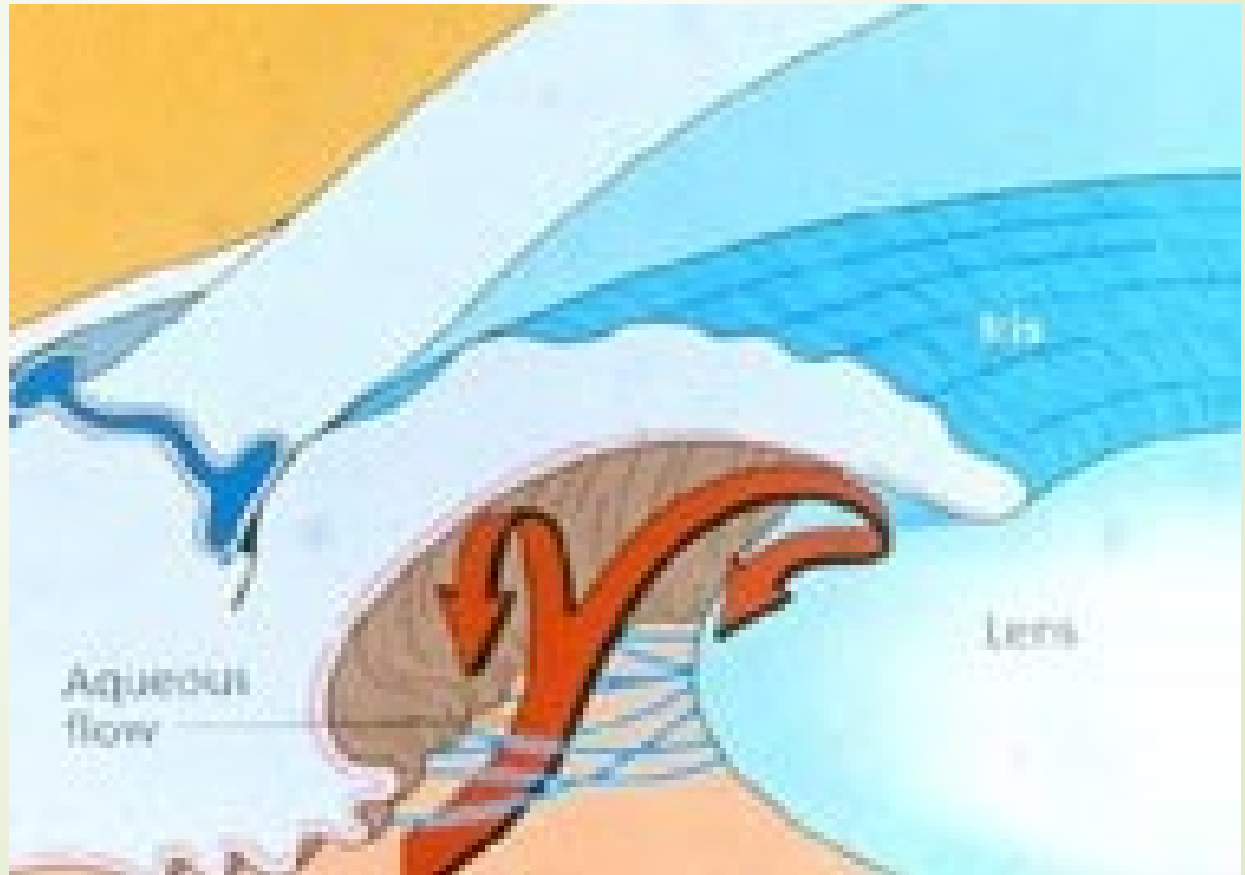
Ulcus corneae



Glaucoma therapy



Narrow angle

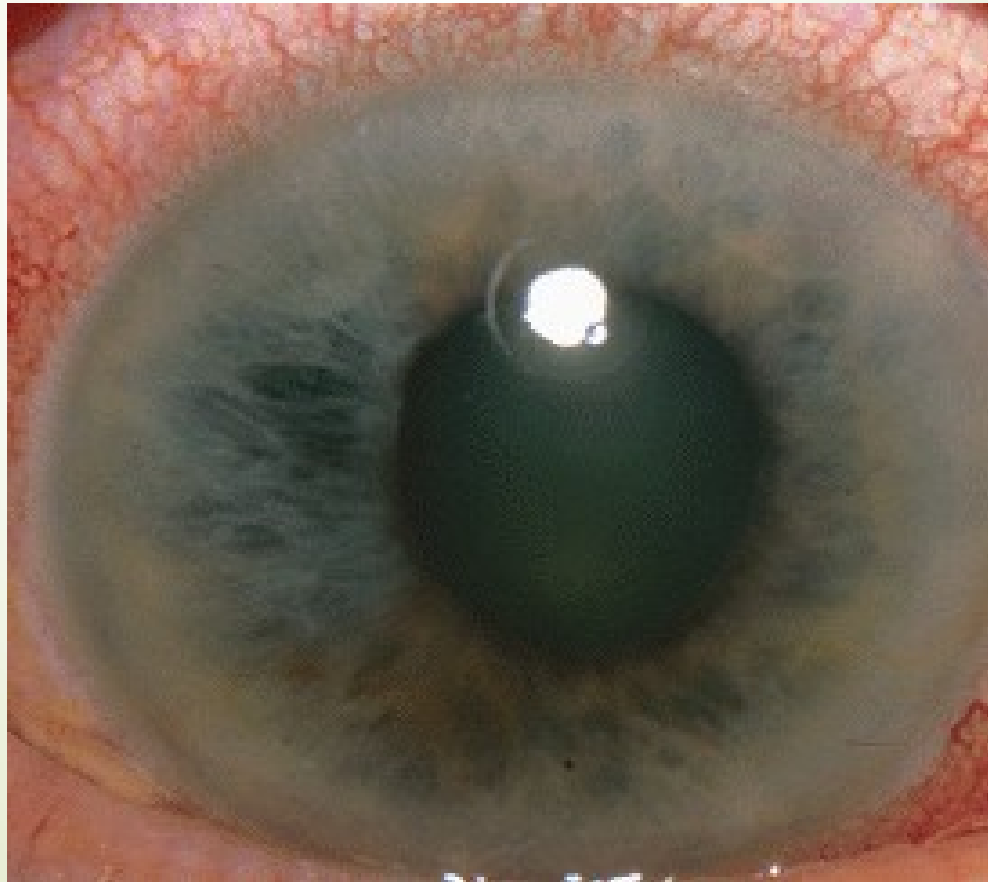




Glaucoma

- Congenital
 - Juvenil
 - Open angle
 - Close angle
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Acute Glaucoma



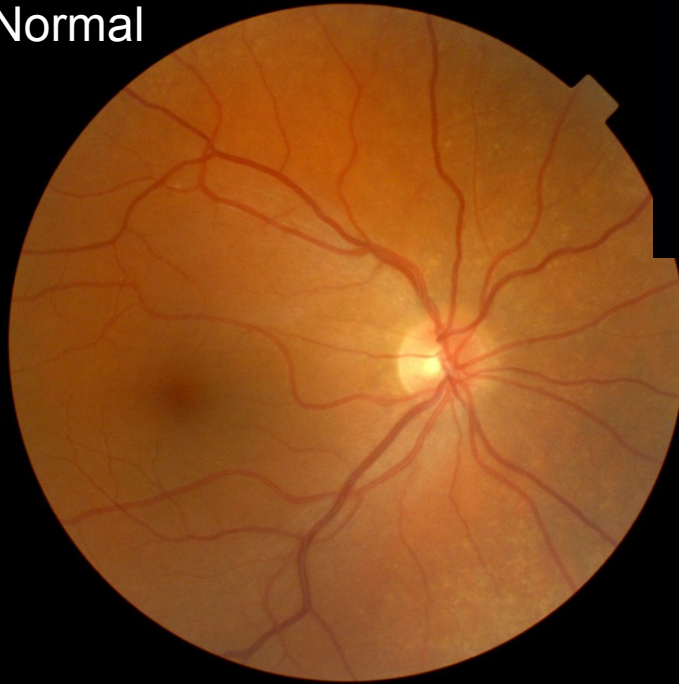


Therapy

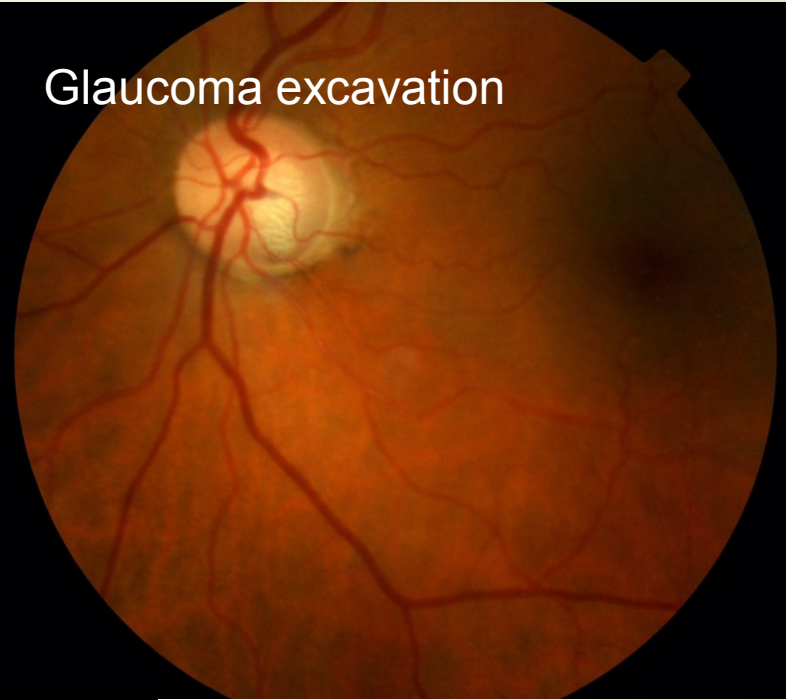
- Drops
 - Laser
 - Surgery (glaucoma implants)
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Normal



Glaucoma excavation





Drops

- Lowering intraocular pressure / miotics, alfa sympatomimetics, prostaglandins
- Lowering intraocular pressure: betablockers, inhibitors carboanhydrasis
- Osmotic agents
- Drops which raise outflow of intraocular humour, pilocarpapine



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- Lowering intraocular pressure: betablockers, inhibitors carboanhydrasis