Ophthalmology

Eye and aging

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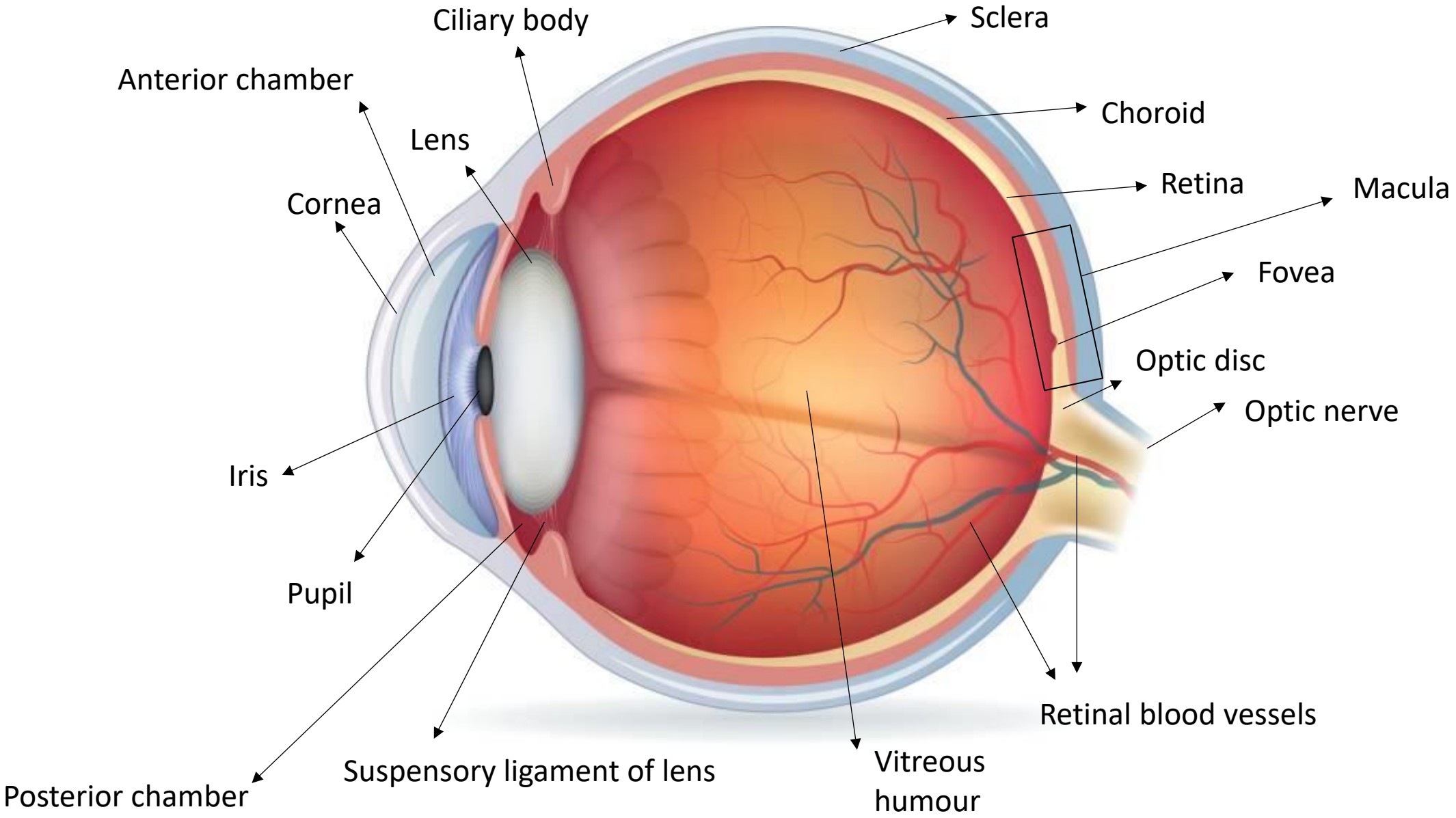
Anotomy of the Eye

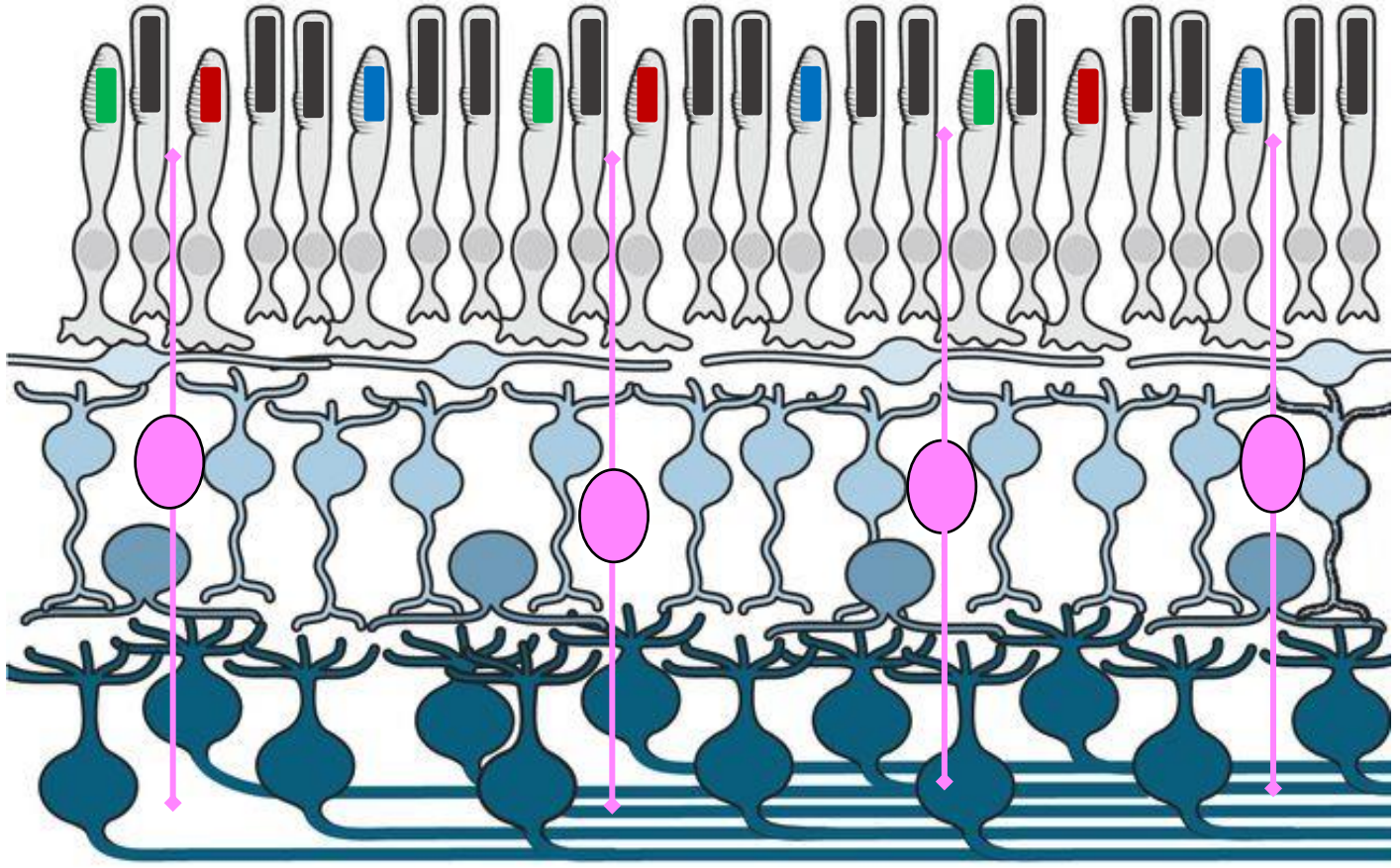
- Structure
- Function

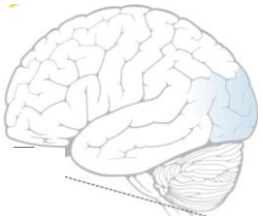
Eyeball


Ciliary body
Sclera
Anterior chamber
Choroid
Lens
Retina
Macula
Cornea
Fovea
Optic disc
Optic nerve
Iris
Pupil
Retinal blood vessels
Suspensory ligament of lens
Vitreous humour
Posterior chamber

Retina

- Photoreceptors
- Horizontal cells
- Bipolar cells
- Amacrine cells
- Retinal ganglion cells
- Müller Glia





Retinal Pigmented Epithelium

Objectives of good care

Young population

- Vision 10/10
- Normal IOP
- Good Visual Field
- Vision without glasses

Geriatric population

- Independence
- Quality of life
- Romberg
- Sociability

Ophthalmic geriatric consultation

- Evaluate visual function
- Detect ocular problems
- Consider the context
- Provide solutions

Visual performance
Psychosensory tests

- Visual acuity decrease
- Visual field loss
- Color perception decrease
- Loss of contrast
- Nyctalopia

Neurological deficits

- Understanding
- Expression
- Confusion
- Contact

Ocular diseases in elderly patients

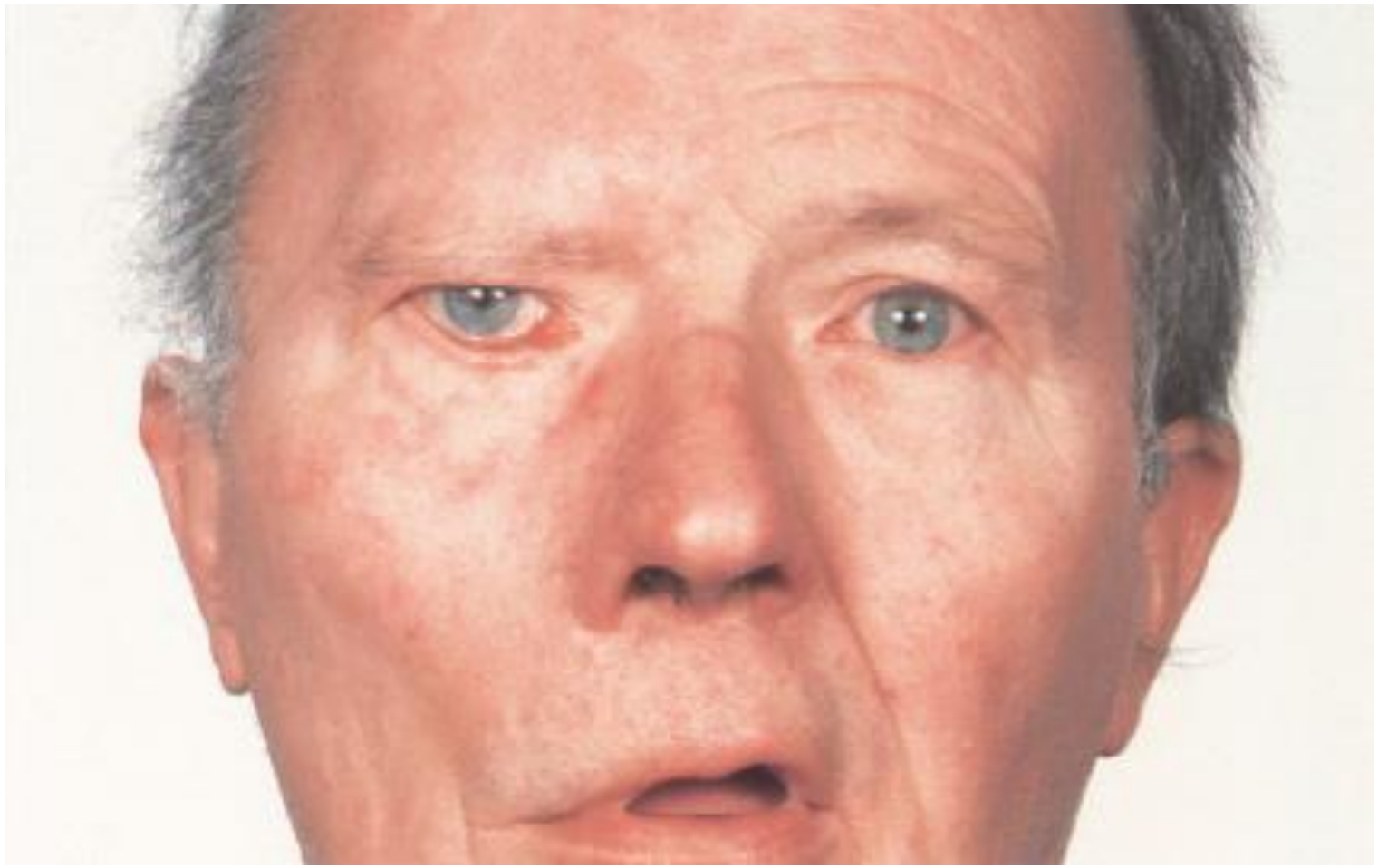
- Extraocular structures:
  - Eyelids
    - > Blepharochalasis
    - > Entropion
    - > Ectropion
  - Lacrymal gland
    - > Dry Eye
- Eyeball:
  - Anterior structures (cornea, lens)
    - > Cataract
    - > Corneal decompensation
    - > Keratitis
  - Posterieur structures (retina, optic nerve)
    - > Age-related-macular disease (AMD)
    - > Diabetic retinopathy
    - > Ischemic optic neuropathy (NAION)
    - > Horton arteritis (AAION)
    - > Glaucoma (chronic and acute)

Blepharochalasis

Entropion

Ectropion

Paralytic ectropion



Infectious Keratitis

- Baterial
- Viral (HSV)
- Fungal
- Acanthamoeba

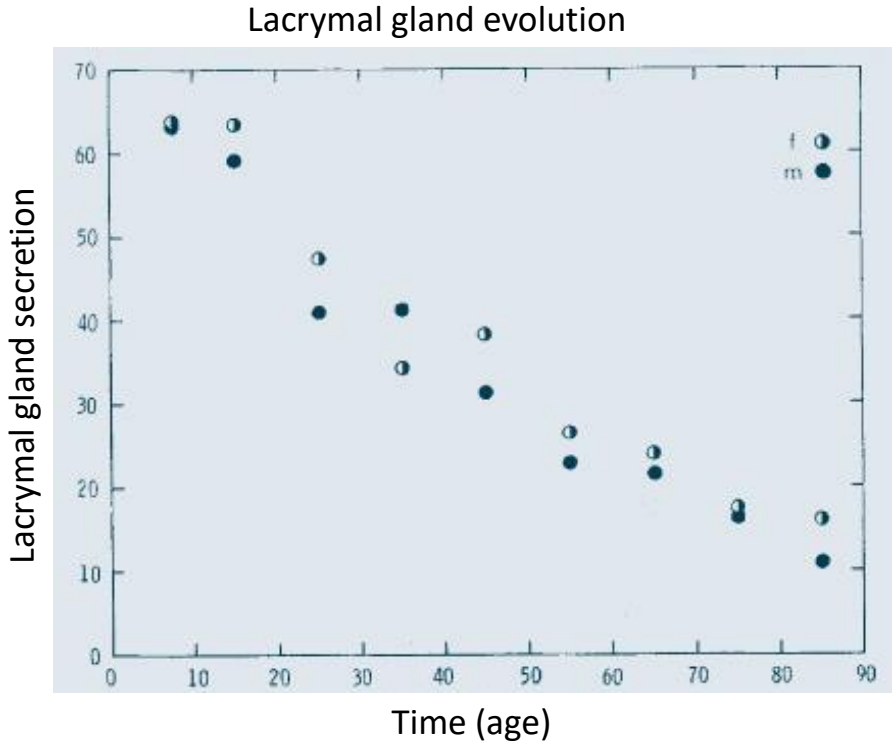
Infectious Keratitis
Risk factors

- Cataract wound and suture-stitch (12 o'clock)

- Epithelial defect
  - Contact lenses
  - Dry eye
  - Neurotrophic keratitis (= damage of the afferent pathway (trigeminal nerve) of the "corneal blink reflexe")
  - Corneal decompensation
  - Lagophtamic eye
  - Lagophtalmos
  - Trichiasis

- Decrease immunity
  - Systemic factors
  - Cancer/oncologic treatments
  - Local use of corticosteroids

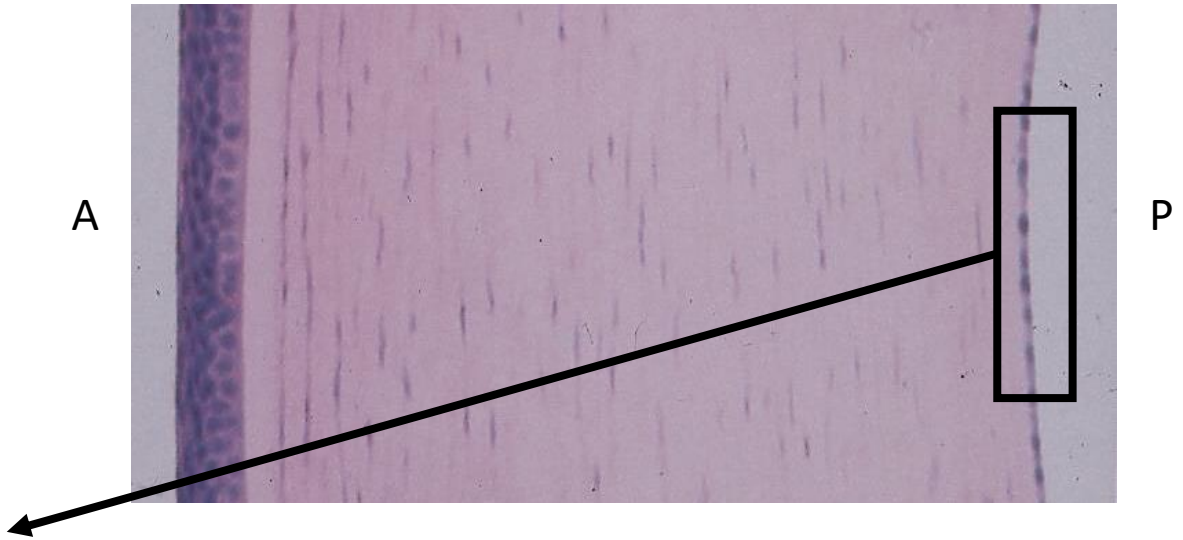
Dry Eye

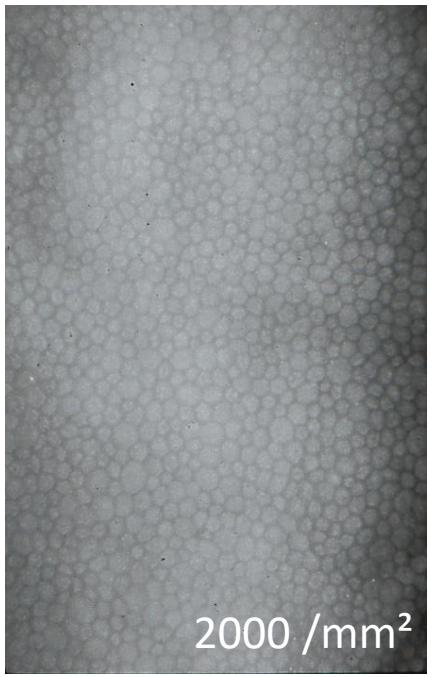


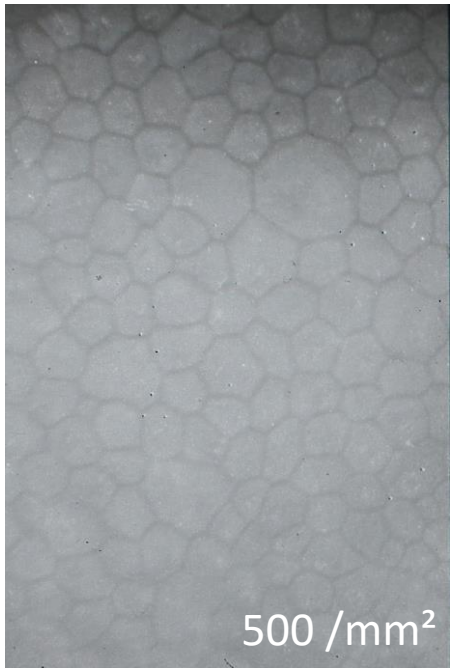
>>> Decrease of tear production from lacrymal gland

- Age-related involution
- Sjogren
- Corneal hypoesthesia (trigeminal nerve damage, HZV, diabetes)
- Anticholinergic AEs of many drugs (sedatives, neuroleptics, H1 antiH)

Histology of the Cornea

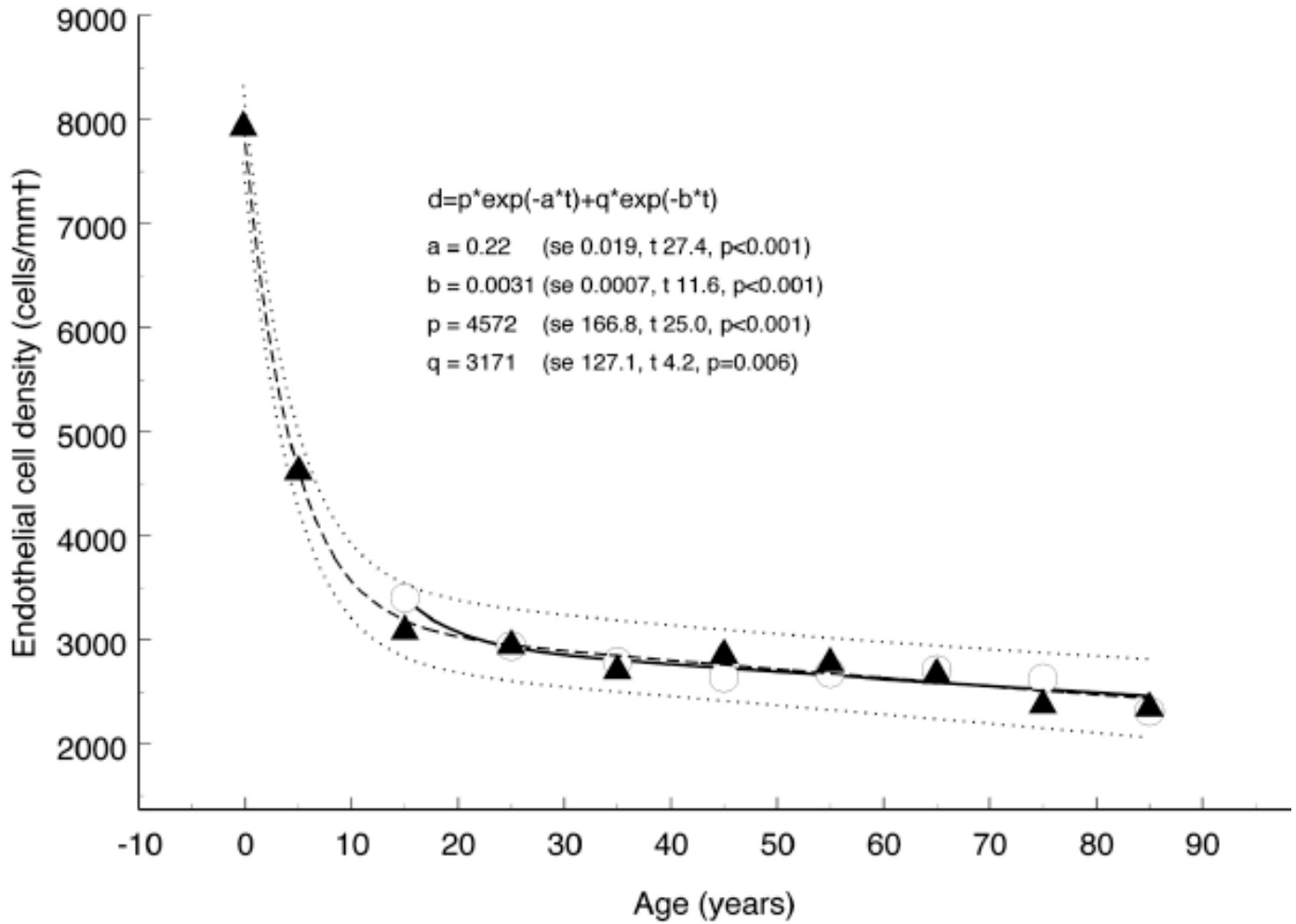




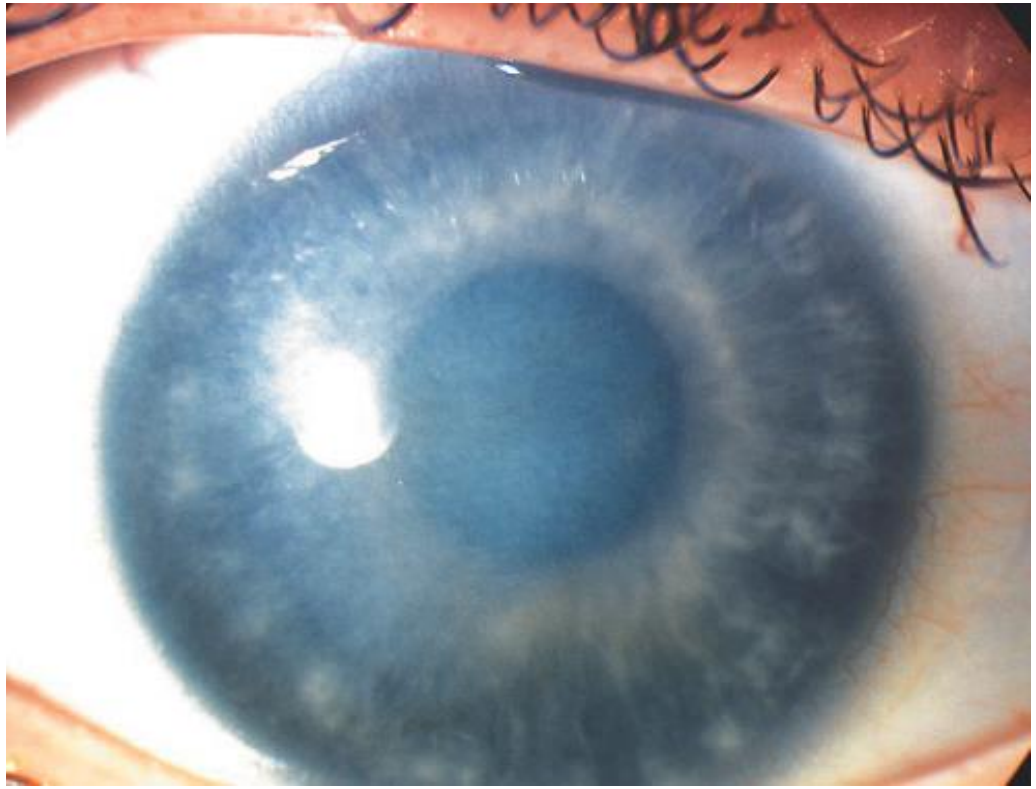


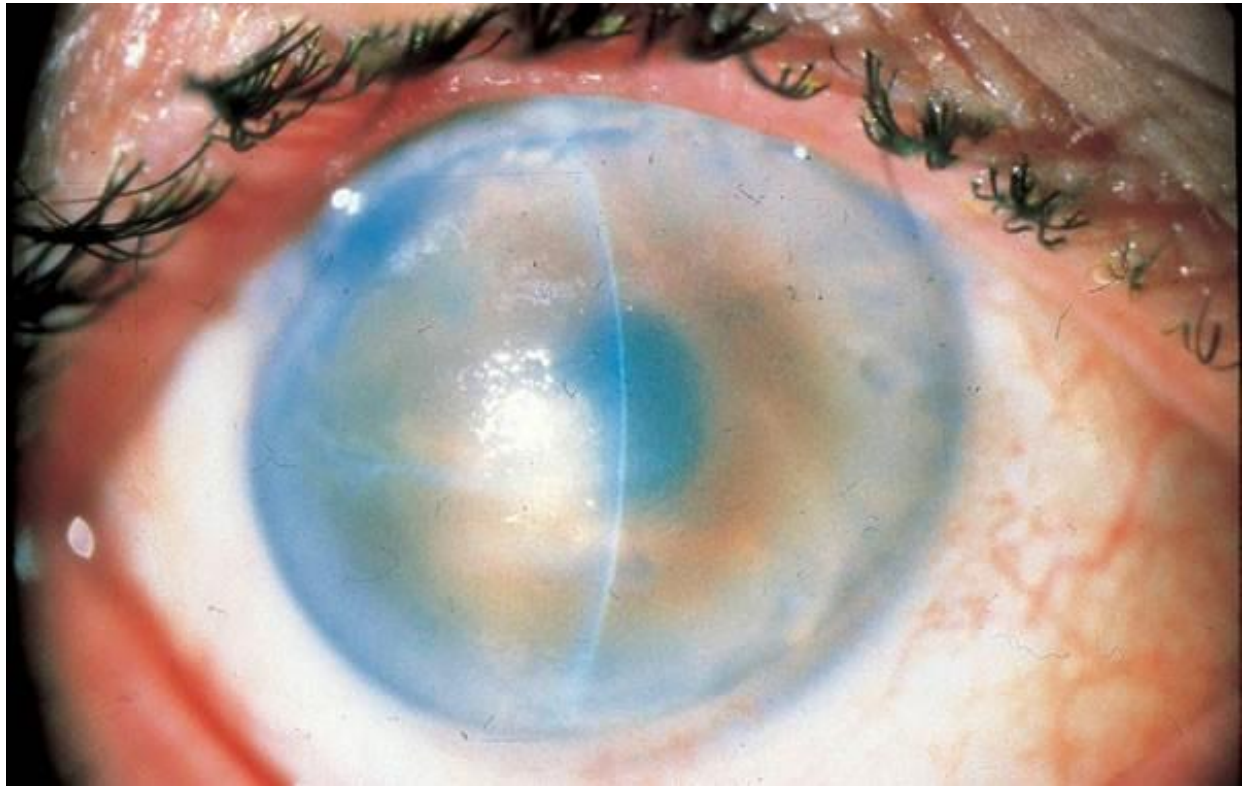
>>> *In vivo* evaluation of cell density by specular microscopy

Decrease of cell count with age



Corneal decompensation

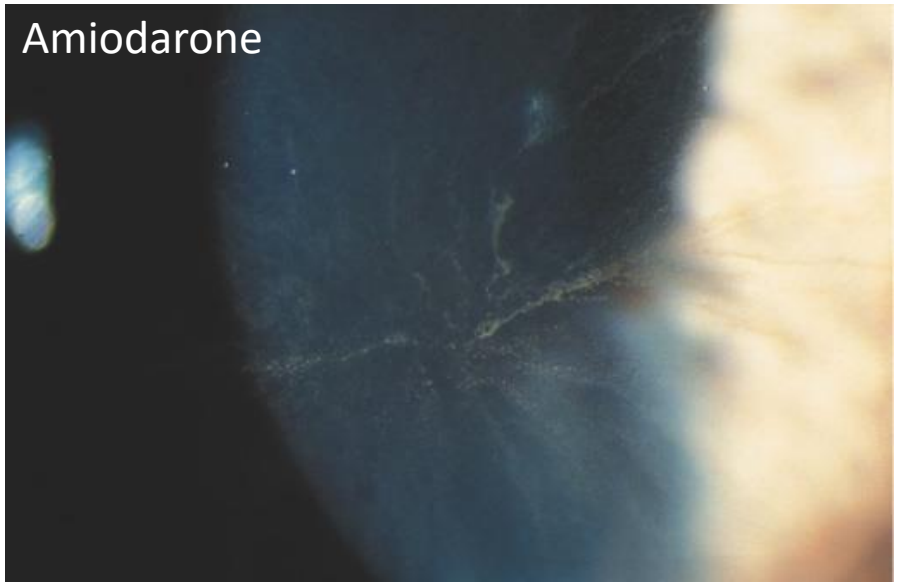


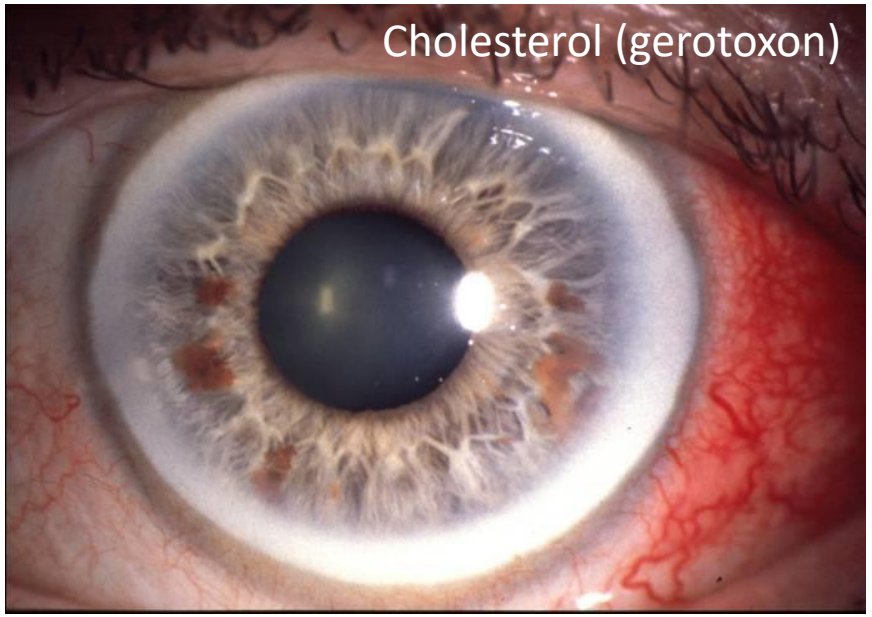


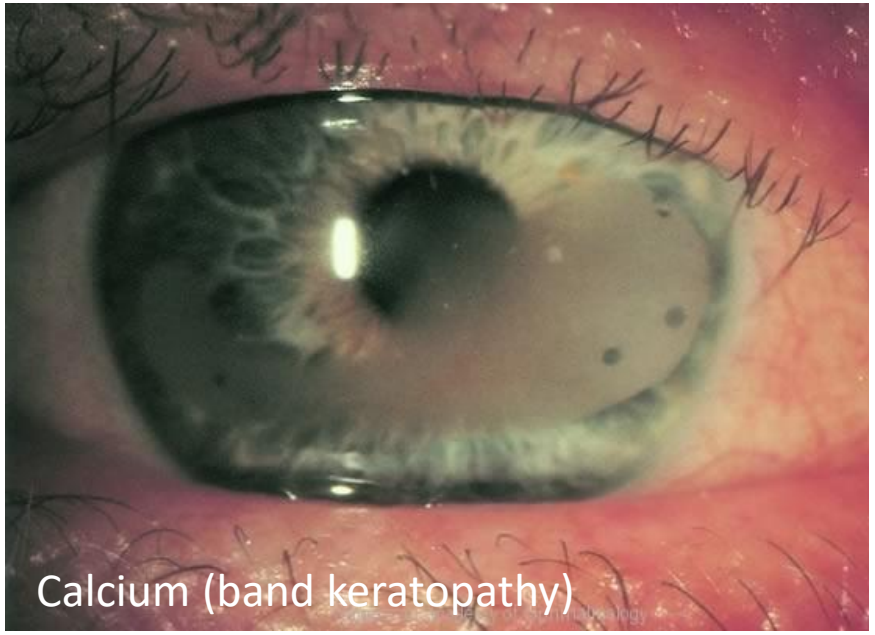
Corneal decompensation Mechanisms

- Age related involution
- Genetic (oligogenic) > Cornea Guttata
- Complicated cataract surgery
- Acute Glaucoma

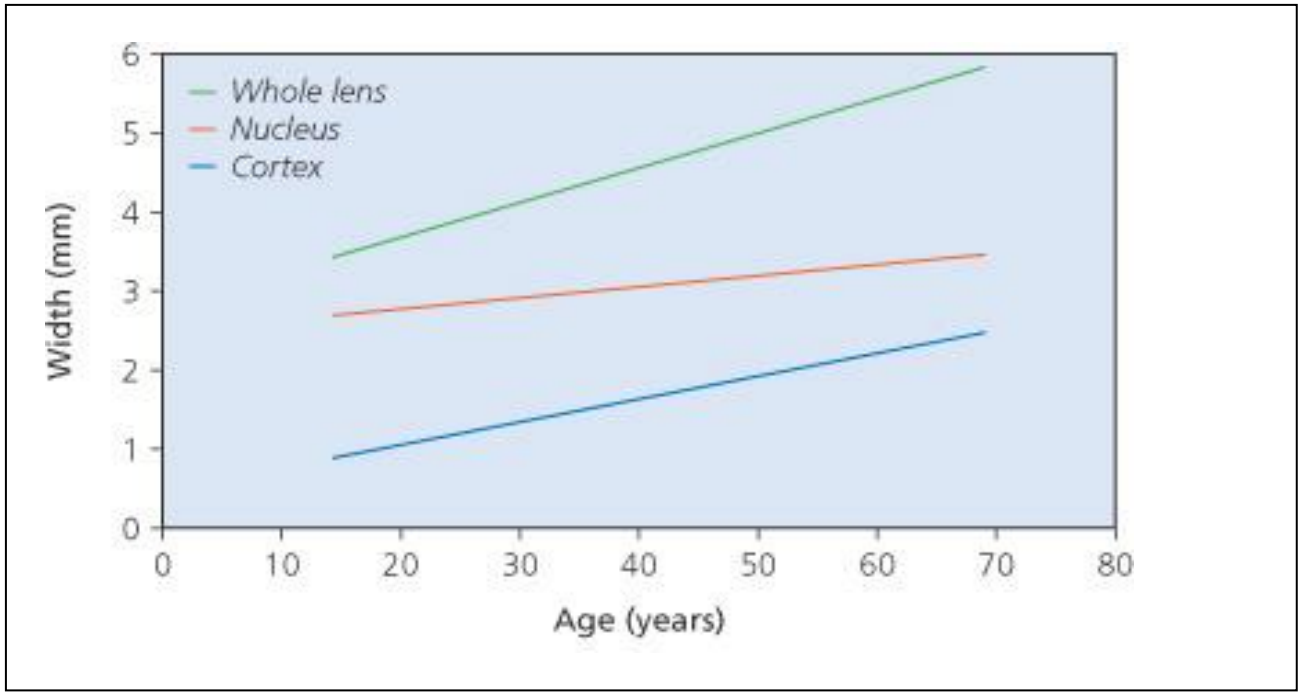
Corneal deposits







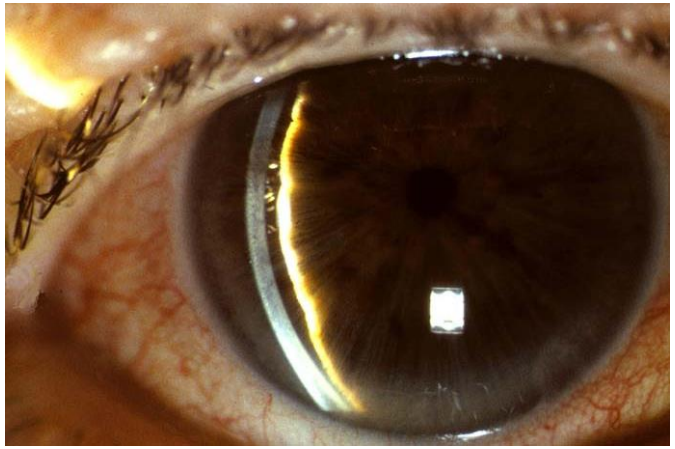
Age related lens modifications

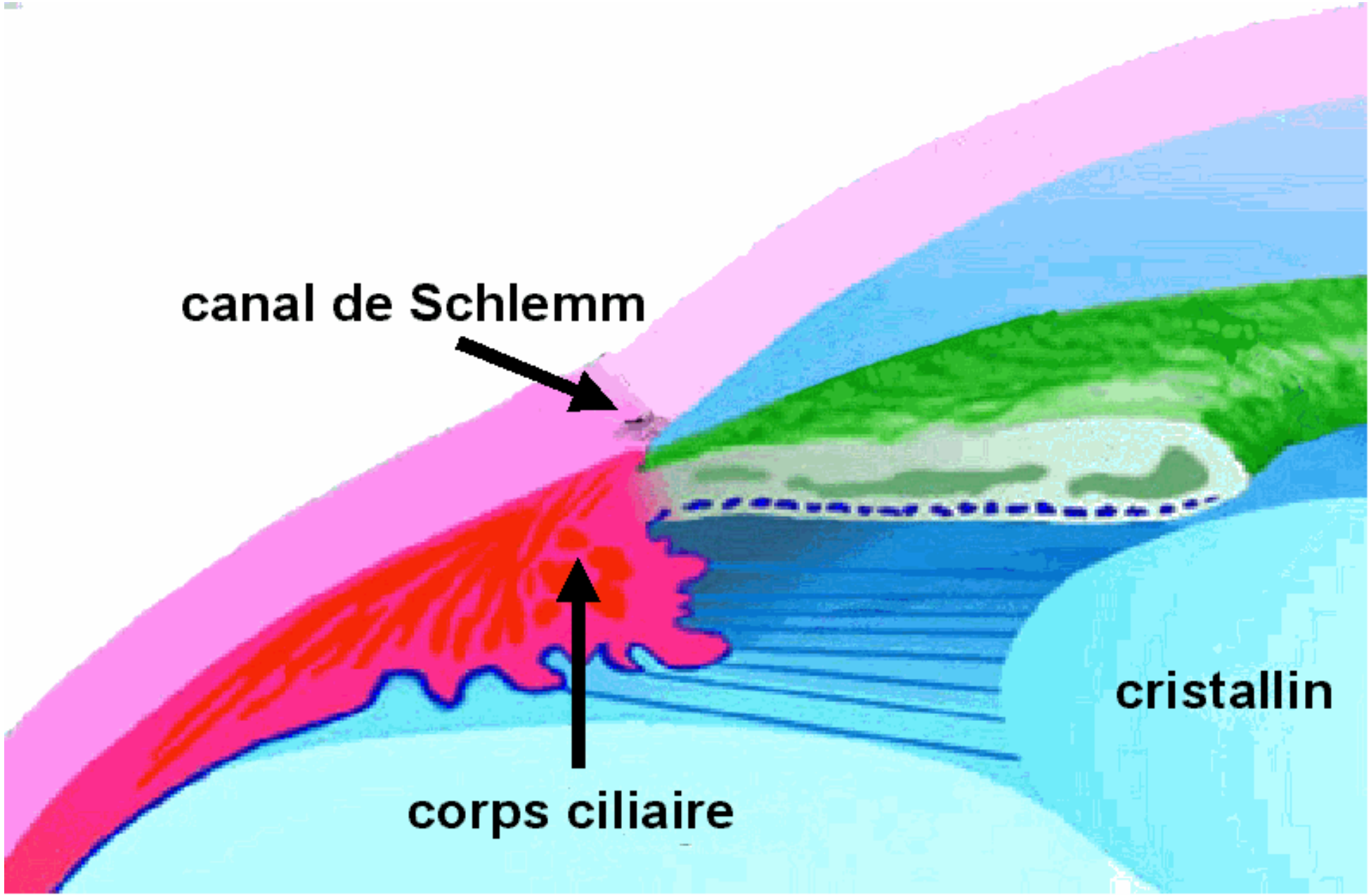


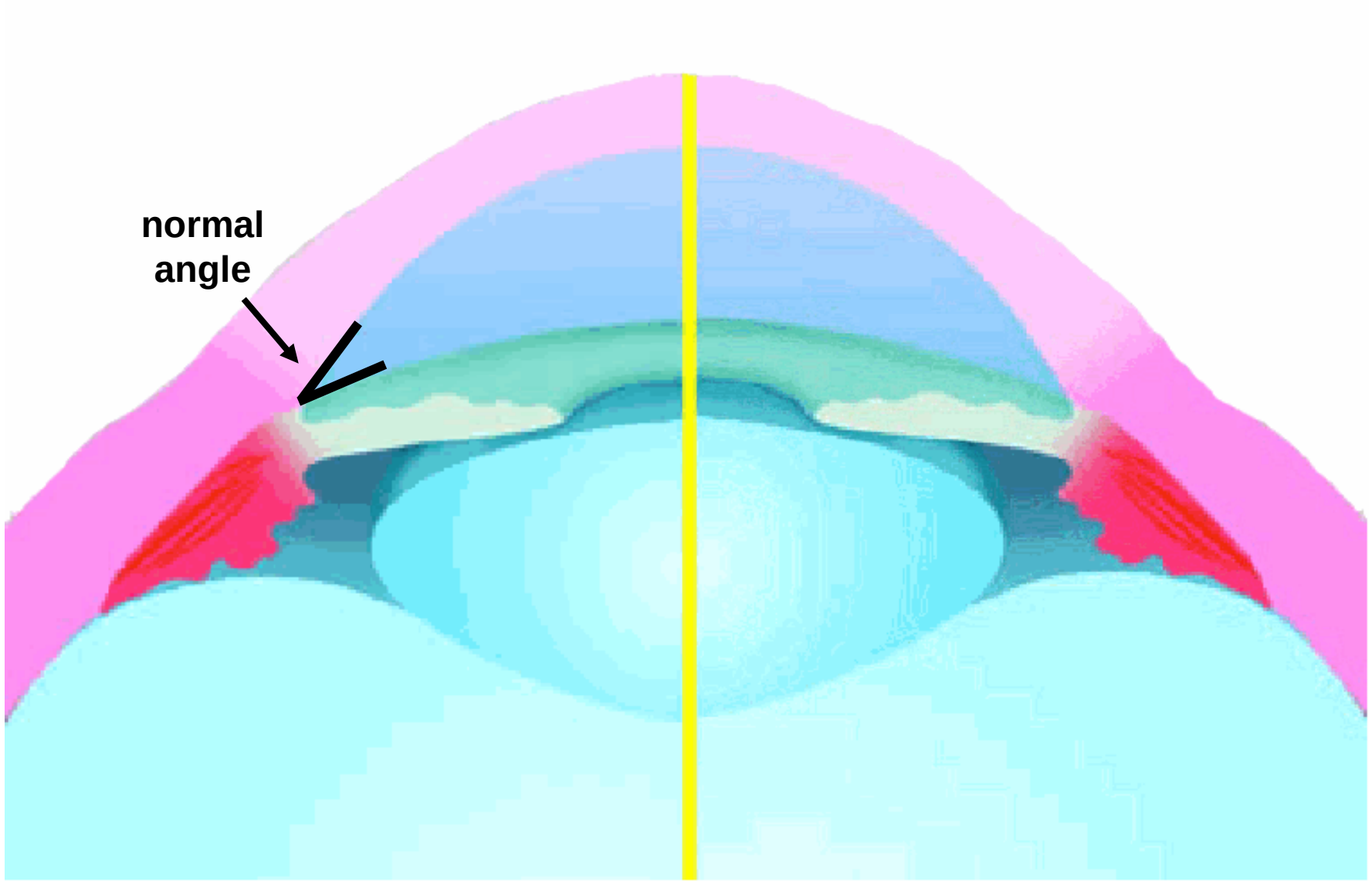
- Presbyopia
- Risk of acute glaucoma by irido-corneal angle closure
- Cataract

Angle closure glaucoma crisis

- Symptoms:
  - Pain
  - Nausea
  - Vomiting
  - Halos
- Signs:
  - Unilateral red eye
  - Semi-mydriasis
  - Corneal oedema
  - Small anterior chamber




canal de Schlemm
corps ciliaire
cristallin


normal
angle

Angle closure glaucoma crisis
Risk and Consequences

- Small hyperopic eyes
- Cataract
- Stress, darkness/mesopic conditions, mydriatic drugs

- Highering of Intra Ocular Pressure (IOP)
  - Optic disk ischaemia
  - Corneal decompensation
  - Iris atrophy

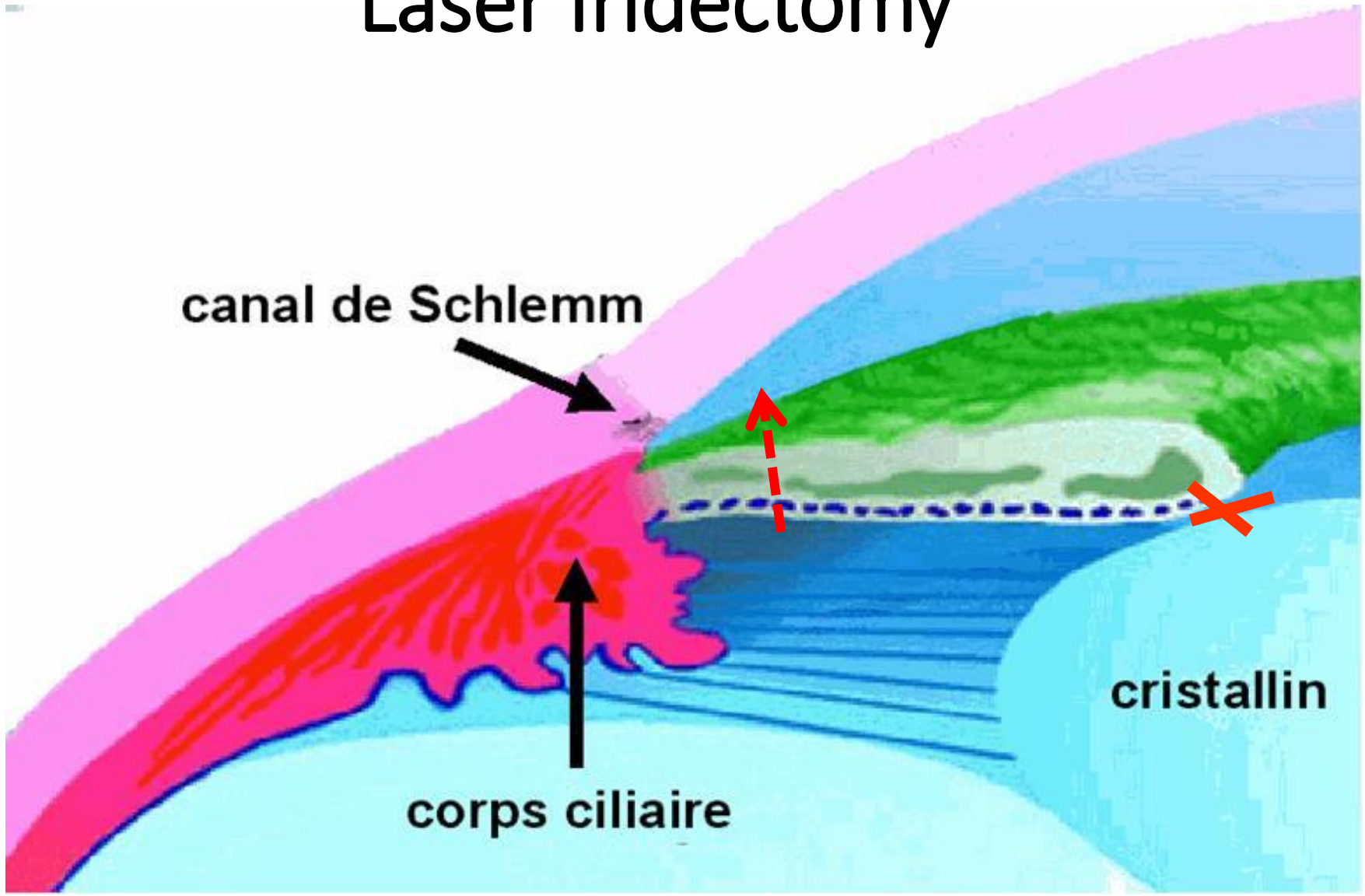
Angle closure glaucoma crisis
Treatment

> Emergency treatment

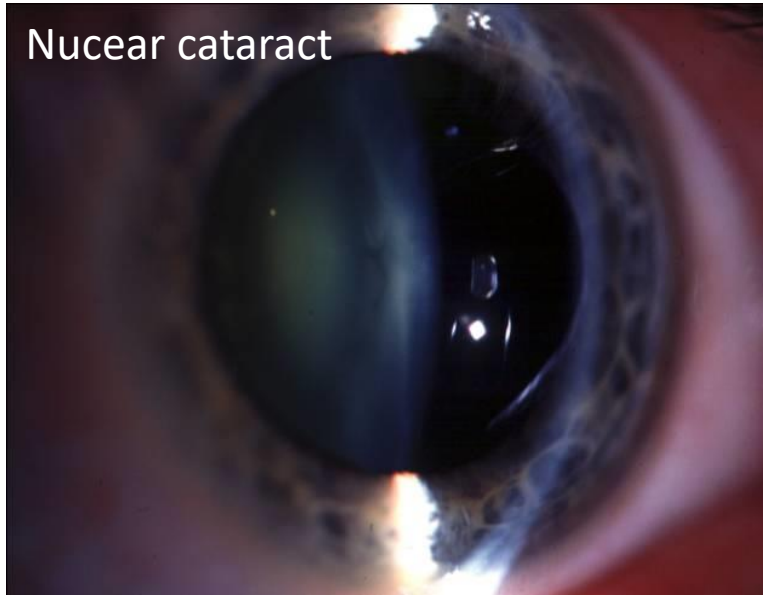
- Decrease IOP
  - Mannitol 20% 200 mL
  - Diamox 500 mgr
  - Local hypotensive drops

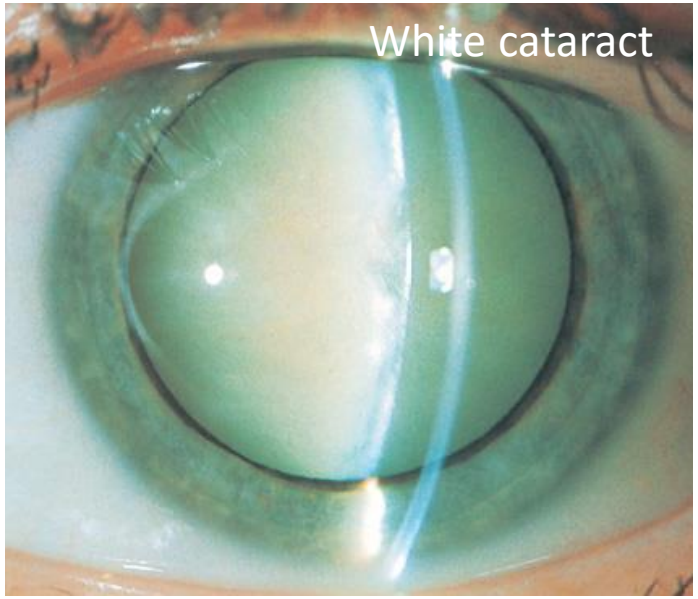
- Prevent recurrence
  - Miotic drops (every hour) (Pilocarpine)
  - Pilocarpine in the fellow eye
  - Laser iridectomy
  - Cataract extraction

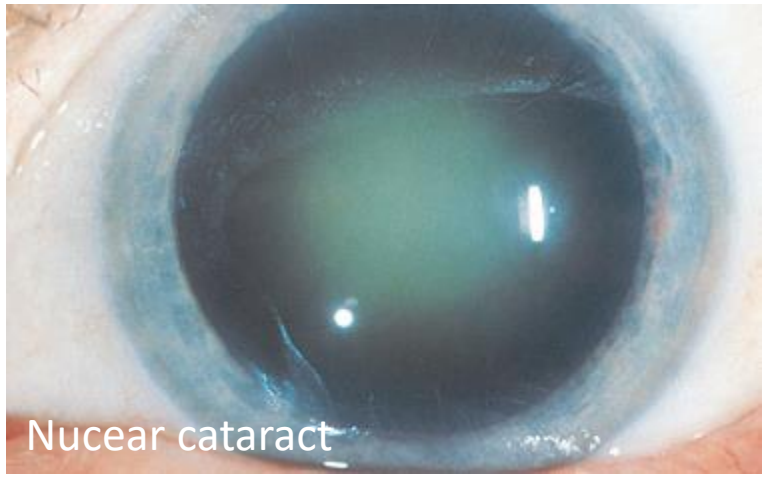
Laser Iridectomy

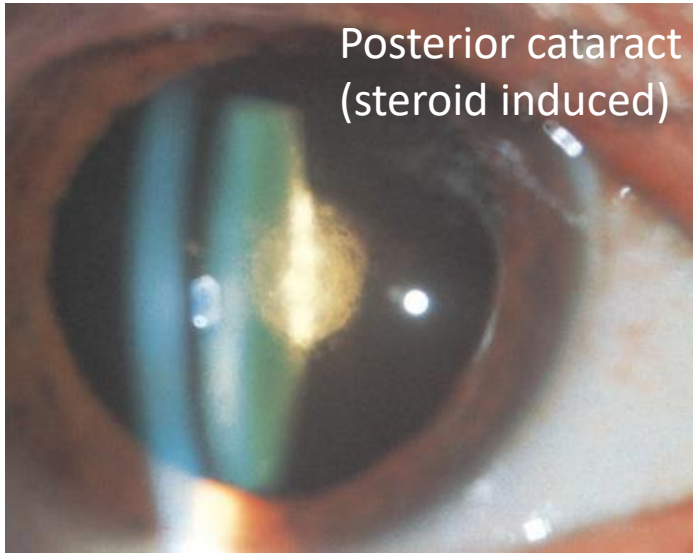


Cataract

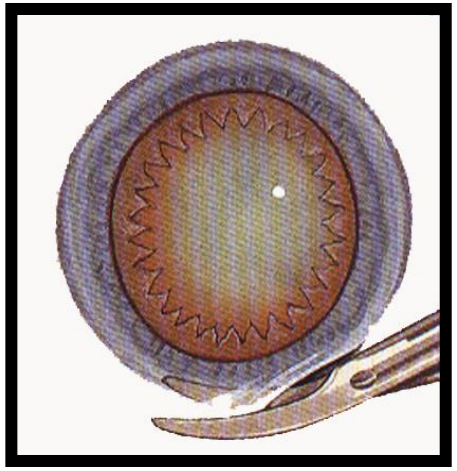

Nucear cataract


White cataract

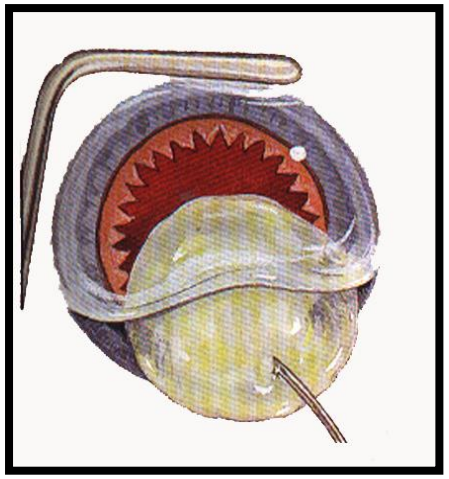

Nucear cataract


Posterior cataract
(steroid induced)

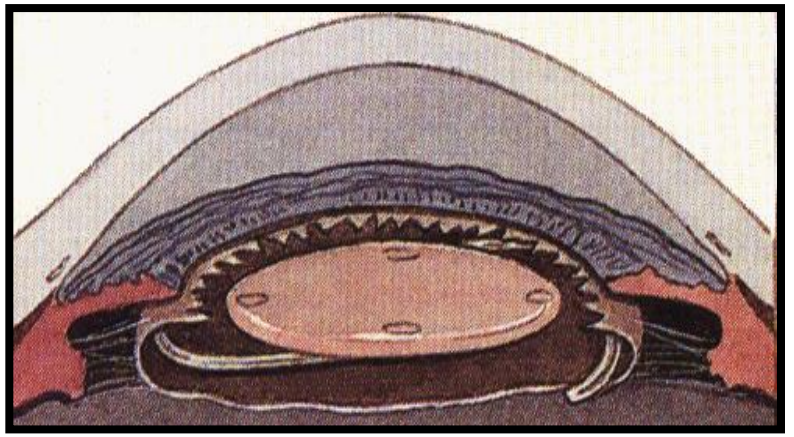
Current Cataract Surgery
3 basic steps



Incision

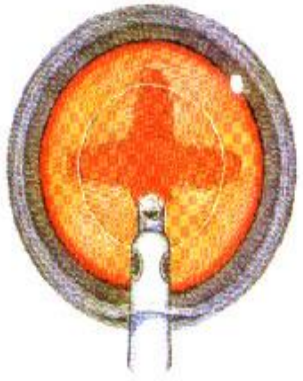


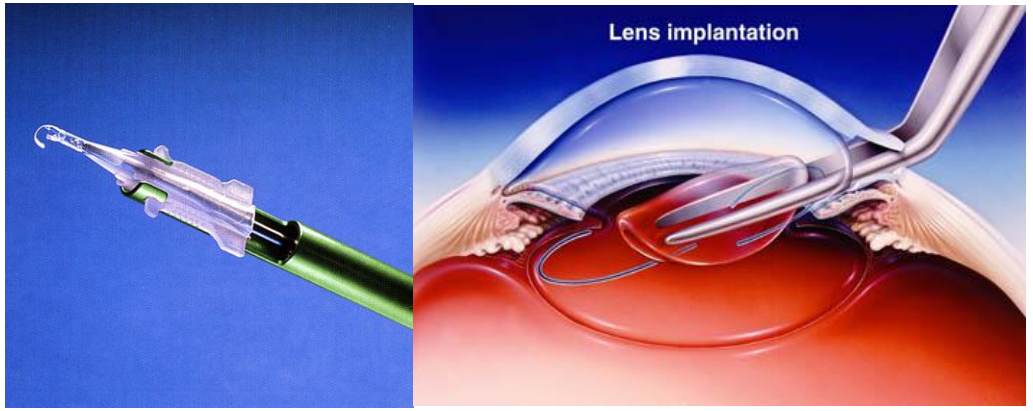
Extraction



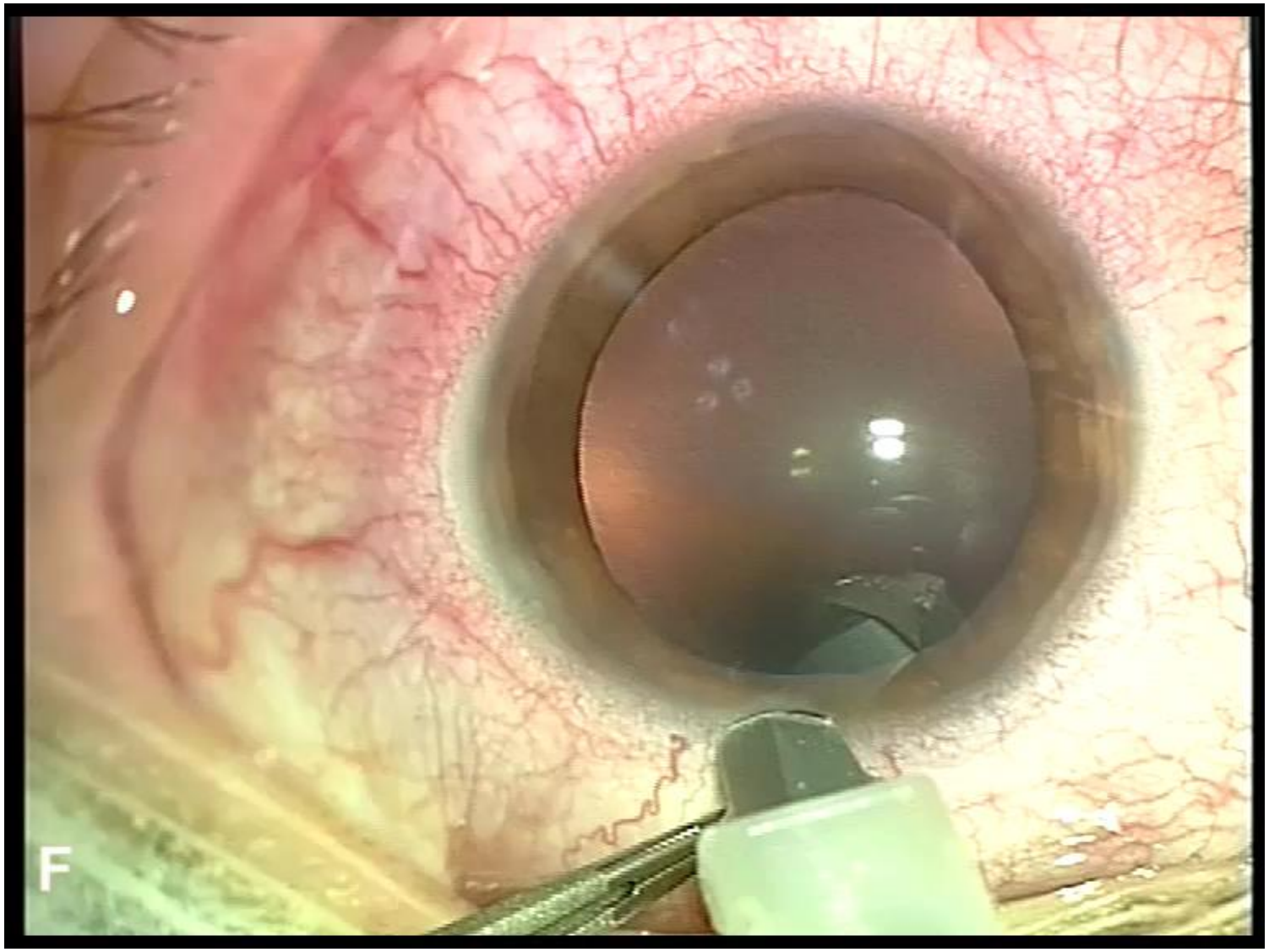
Implantation

2 – 3 mm

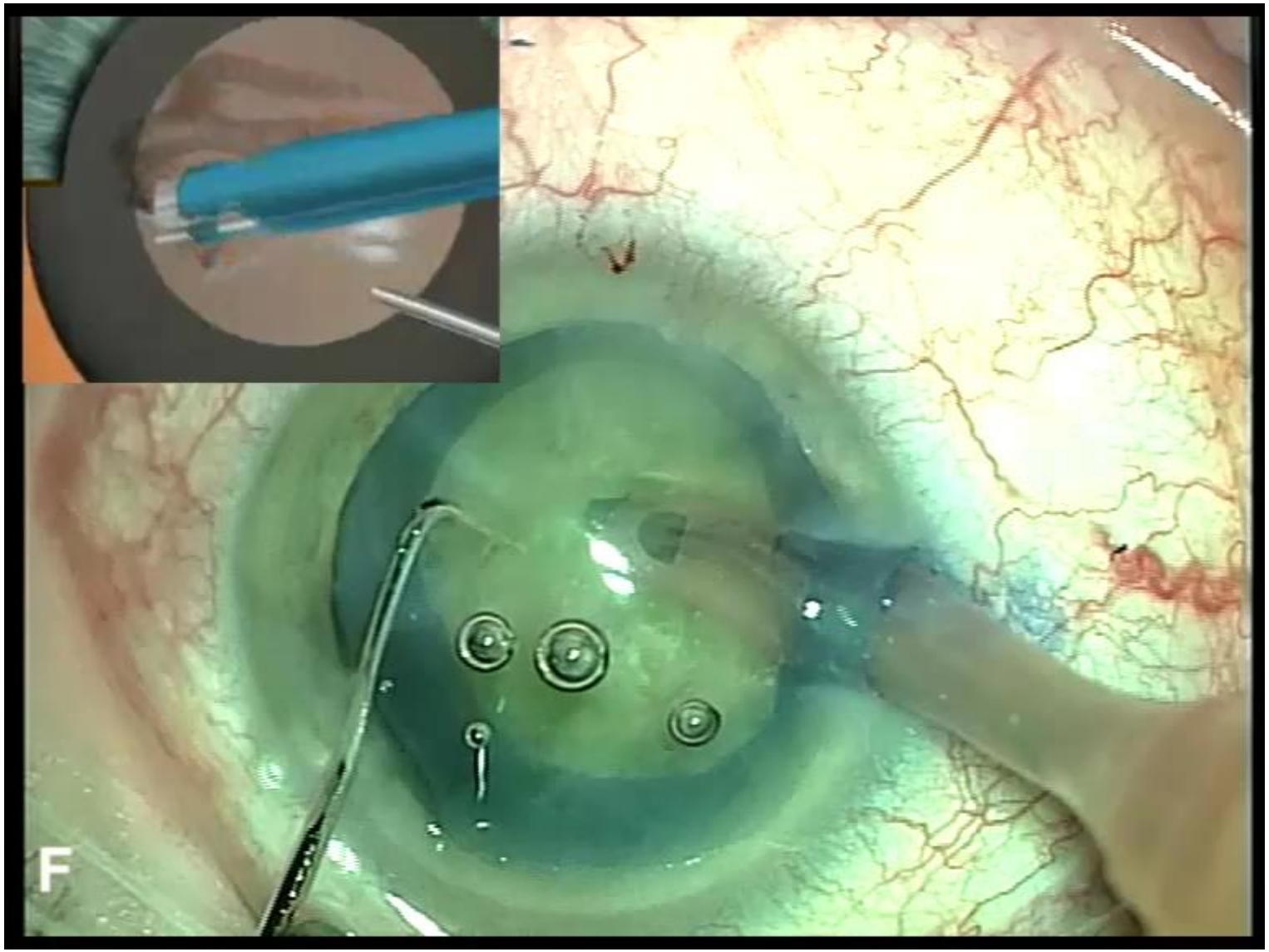




Cataract Surgery – Incision & Capsulorhexis



Cataract Surgery – Phacoemulsification



Cataract Surgery – Implantation

Cataract Surgery
Results and Complications

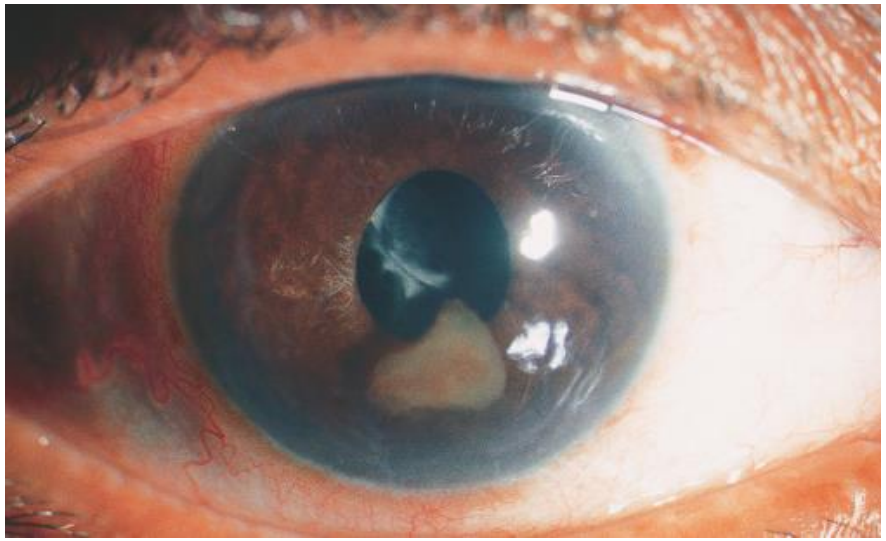
- Excellent recovery
  - ONLY if the rest of the eye is functional
  - ONLY in the absence of complications

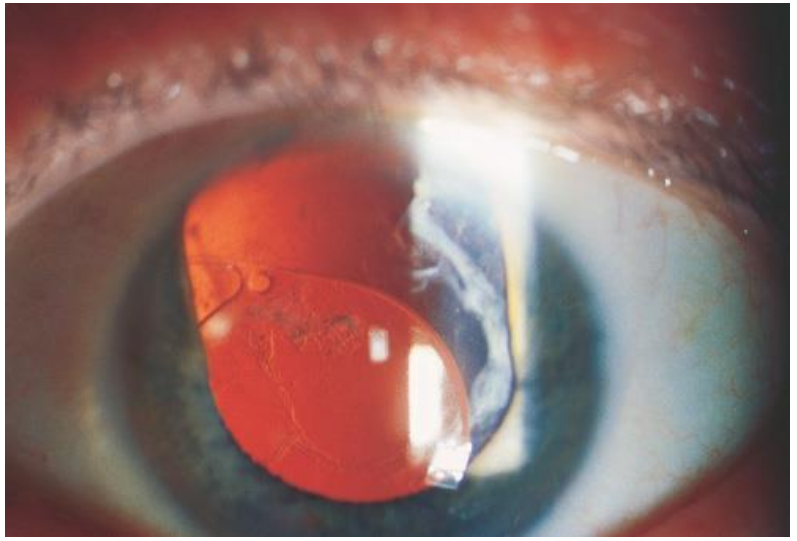
- Complications
  - Surgeon dependent
  - Eye-dependent
  - Patient dependent (Local Anesthesia)

Cataract Surgery Complications

- Corneal complications
- Anterior chamber complications (+/- HIOP)
- Lens related complications
- Capsule opacification (PCO)
- Hemorrhage
- Endophtalmia
- Retinal complications

Cataract Surgery Complications

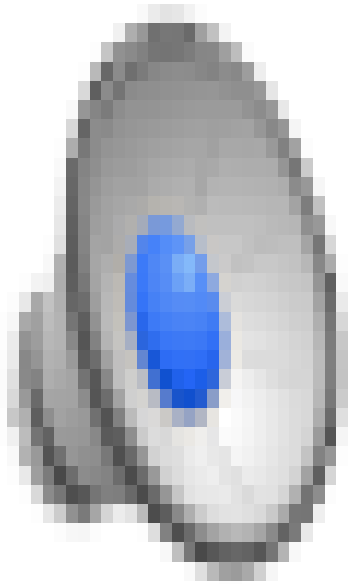




Poor compliance in cataract surgery (local anesthesia)

- Hearing loss
- Desorientation, confusion, Alzheimer
- Uncontrolled movements (Parkinson), blepharospasm
- Respiratory decompensation (cough)
- Cardiac decompensation, vertebral problems…

PCO after cataract surgery



Cataract surgery
Bad visual prognosis

1. Retinal pathology

   - Age related Macular Disease (AMD)
   - Diabetic retinopathy
   - Retinal vasculopathy

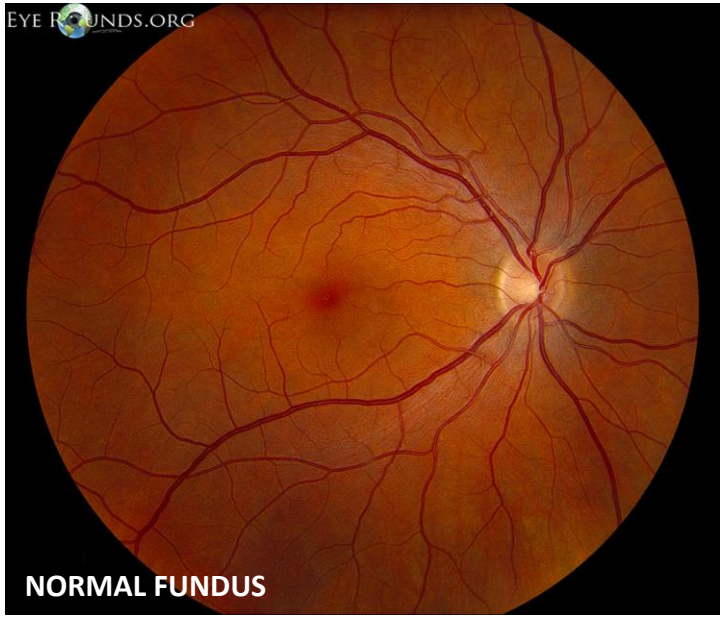
2. Optic nerve pathology

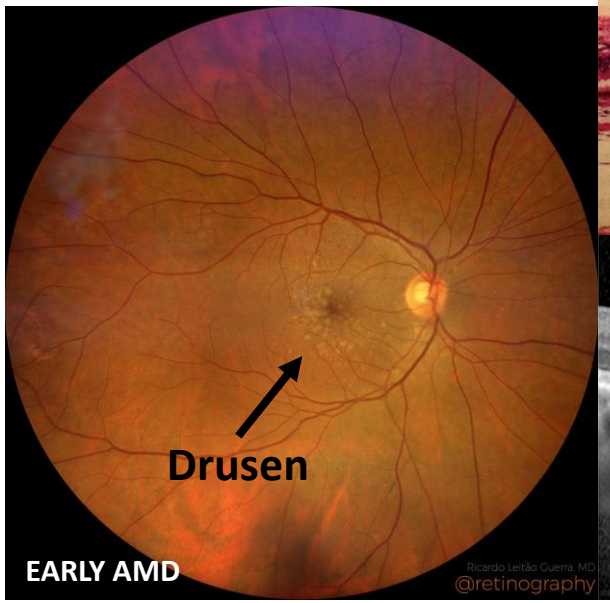
Age related Macula Disease

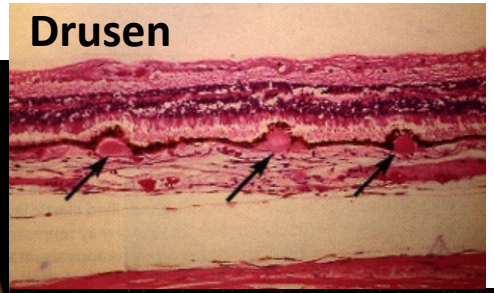
- Common Complex Disease (CCD) (PRS)
- Late-onset neurodegenertive disease that affects the macula
- Leading cause of central vision loss > 75 years old
- 5 clinical Classifications:
    - Non detectable aging changes
    - Normal aging changes
    - Early AMD
    - Intermediate AMD
    - Late AMD:
        - “Dry” AMD (atrophy)
        - “Wet” AMD (néovascular)

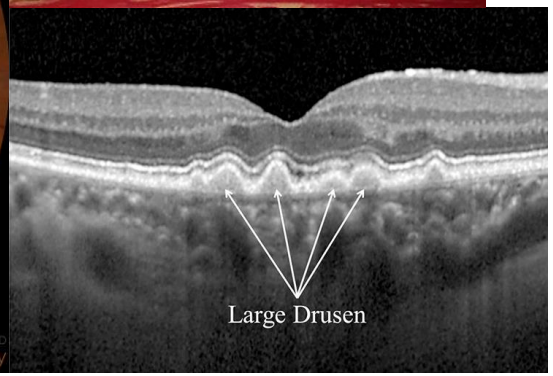
Normal Metamorphopsia Central Scotoma

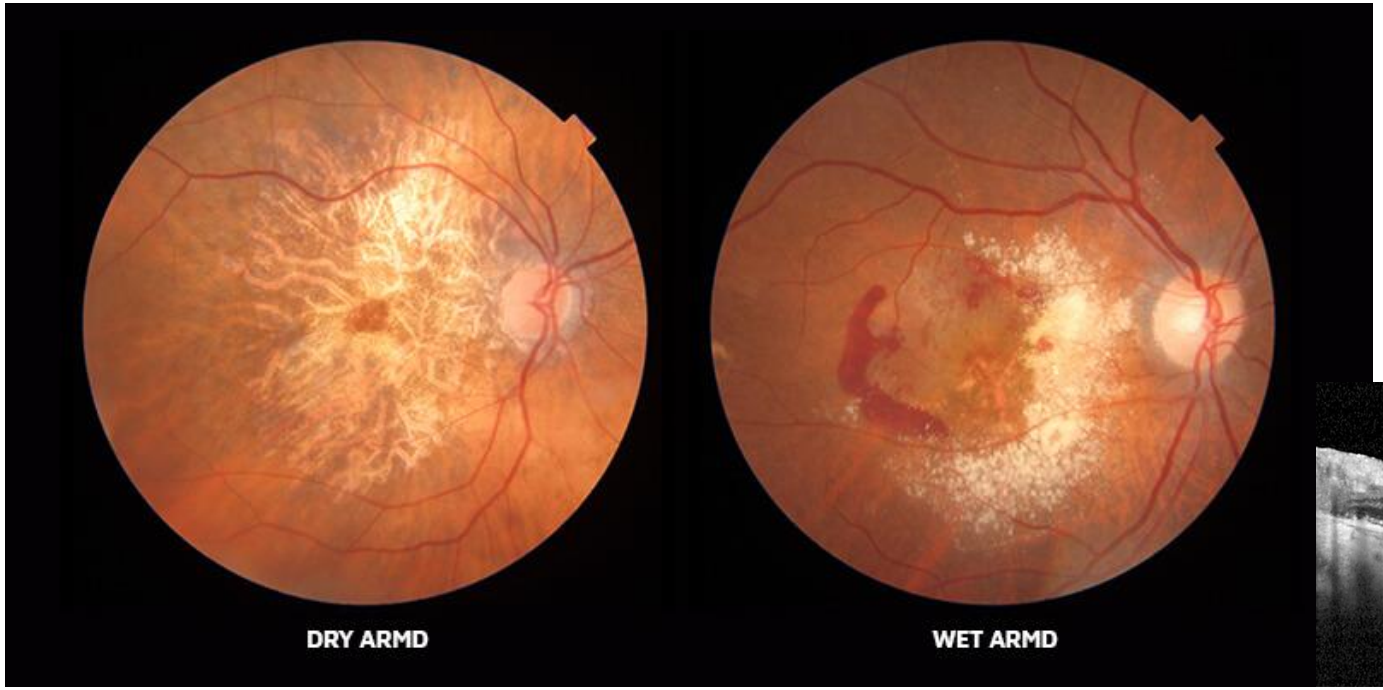
- Clinical parameters of AMD progression: drusen & pigmentary changes

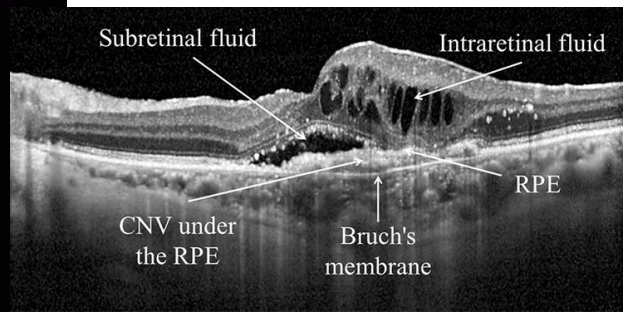

EYE ROUNDS.ORG
NORMAL FUNDUS


Drusen
EARLY AMD
Ricardo Leitão Guerra, MD
@retinography


Drusen


Large Drusen


DRY ARMD
WET ARMD


Subretinal fluid
Intraretinal fluid
RPE
CNV under the RPE
Bruch's membrane

Age related Macula Disease

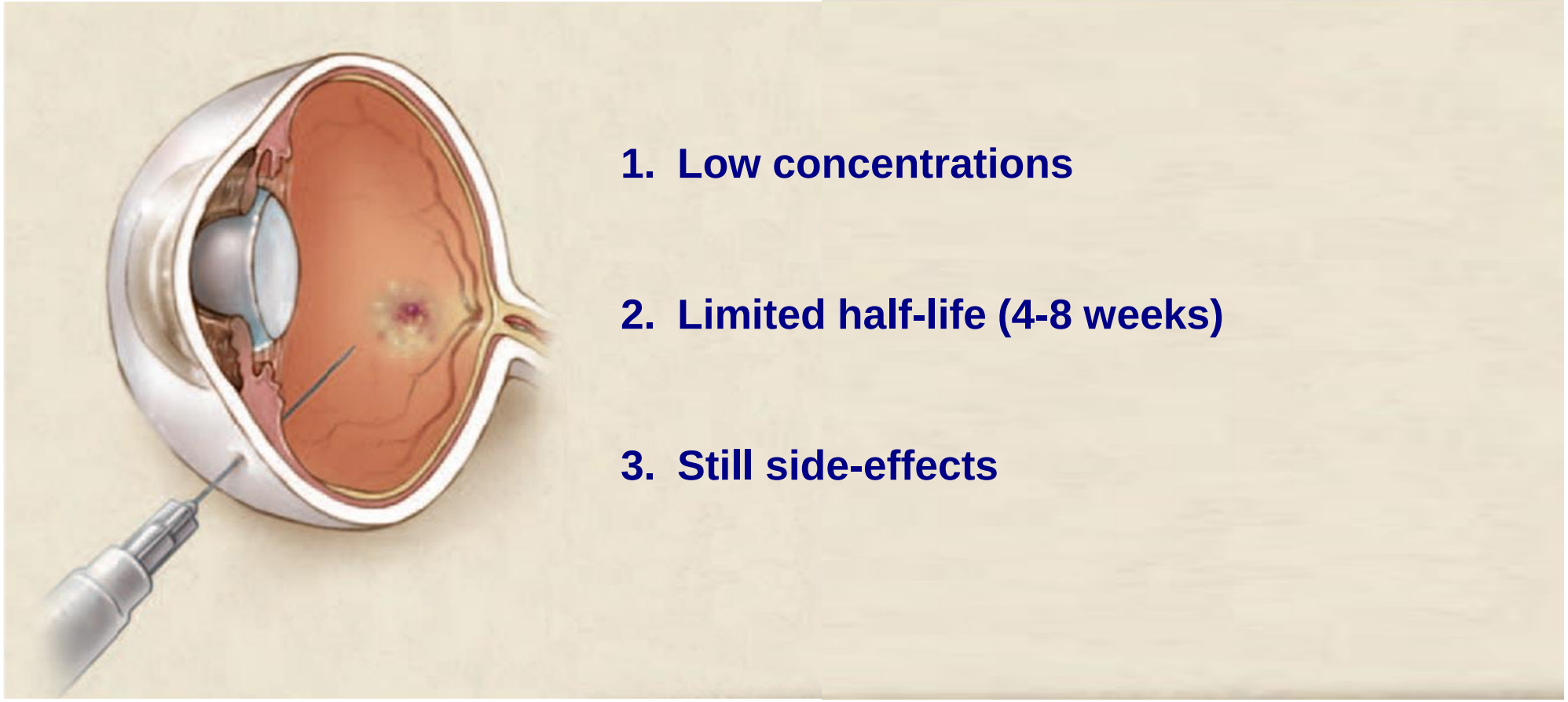
- **Treatment ?**

☞ • Dietary **supplements** suggested by the AREDS in atrophy AMD

☞ • **Intravitreal injections anti-VEGF** in neovascular AMD (Lucentis, Eyléa, Béovu)

Not yet used in clinical pratice

- Ongoing clinical trials for **cell replacement therapies** *(Takahashi et al, 2022)*
- High dose **Statins** preventing AMD progression to neovascular AMD through a reduction of drusen volume *(Vavvas et al., 2016)*
- Intravitreal injections of **Pegcetacoplan** (complement C3 inhibitor peptide) and **Avacincaptad pegol** (complement C5 inhibitor RNA aptamer) approved by FDA *(Wilke and Apte, 2024)*

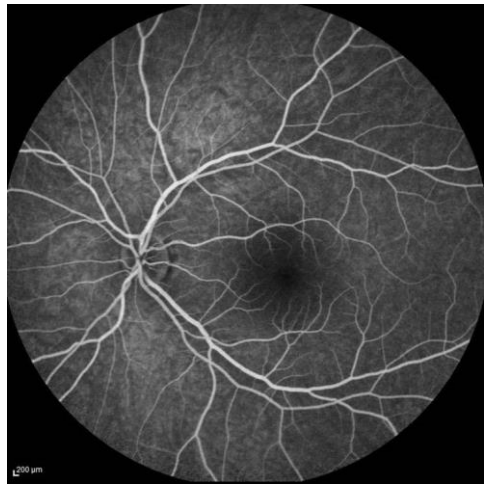


1. Low concentrations
2. Limited half-life (4-8 weeks)
3. Still side-effects

Diabetic retinopathy (DR)

- Prevalence DR increase with time and severity of diabetes

- Effect of hyperglycemia on retinal vessels
  - Obstruction
  - Leakage

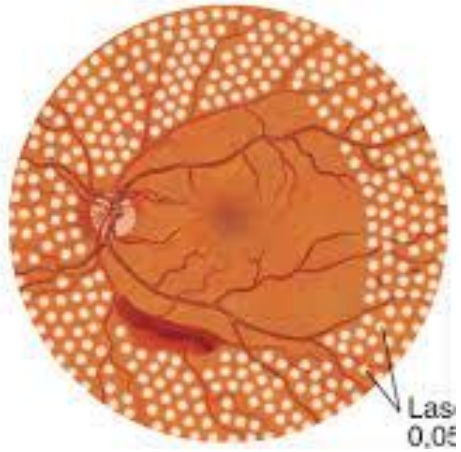


Normal FA

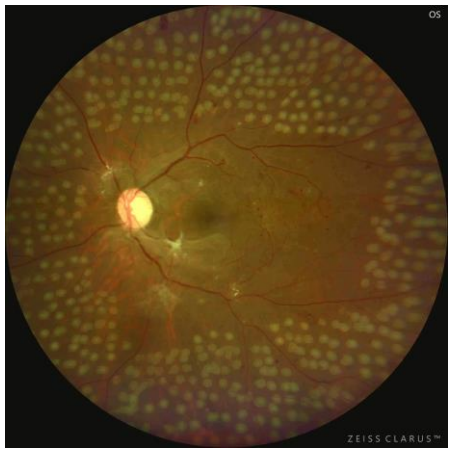
DR FA

- Causes of loss of vision associated to DR
  - Macular edema
  - Microvascular obstruction (ischaemie)
  - Consequences of neovascular vessels (H+, traction, NV Glaucoma)

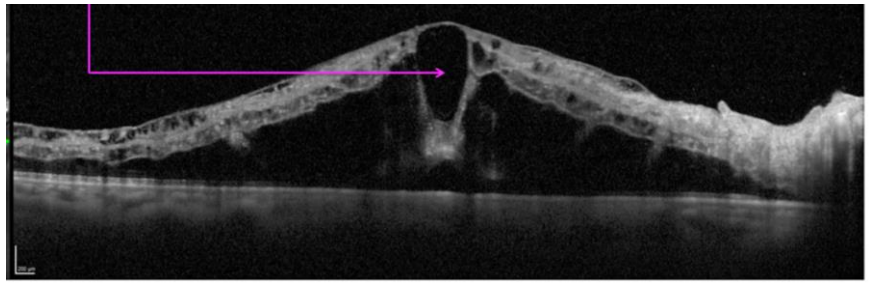
Diabetic retinopathy (DR)

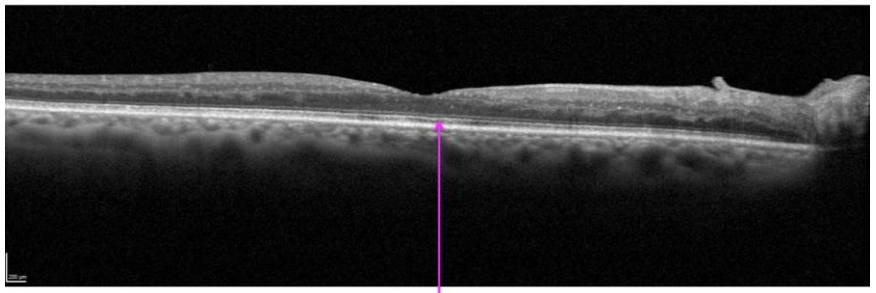


- **Treatment ?**
  - Balance **risk factors**
  - **Laser**
    - Peripheral retinal photocoagulation (PRP) (> “Proliferative” DR)
    - Focal laser
  - **Intravitreal injections anti-VEGF/Triamcinolon**
  - +/- **retinal surgery**



Macular edema





No more macular edema

Cataract surgery
Bad visual prognosis

2. Optic nerve pathology

- Chronic glaucoma
- Optic neuropathy
  - Non arteritic anterior ischaemic optic neuropathy (NAION)
  - Arteritic anterior ischaemic optic neuropathy (AAION) = Horton

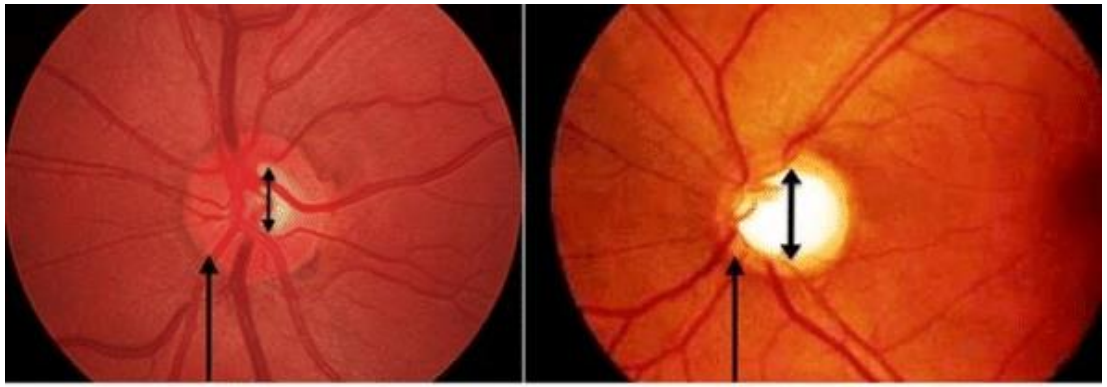
Chronic Glaucoma (OAG)

- Chronic open angle glaucoma (OAG) >< acute glaucoma

- > Irreversible loss of ganglion cells

- Visual field loss

- Prevalence of OAG (=1.1 et 2.2%)
  - ↑ in eldery population
  - ↑ in afro-americans



Normal optic nerve head | Glaucomatous cupping

Glaucome chronique à angle ouvert
fréquence (%)

Age	caucasiens		afro-américains	
40–49	0.18	(543)	0.95	(632)
50–59	0.32	(618)	3.58	(699)
60–69	0.77	(915)	5.05	(614)
70–79	2.85	(631)	7.74	(349)
80	1.94	(206)	10.89	(101)
Total	1.10	(2913)	4.18	(2395)

↓ X 10

Chronic Glaucoma (OAG)

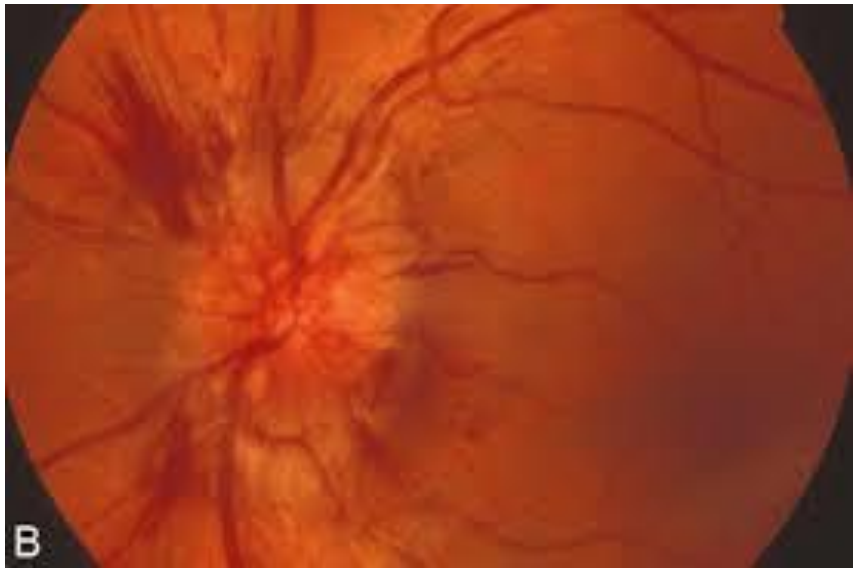
- **Treatment ?**

- Risk factors in OAG:
  - ↑ Intra ocular pressure
  - Age
  - Genetics
    - Ethnic group
    - Family history
  - Thin cornea

→
- **Local hypotensive eye drops**
- **Laser**
- **Surgery**

Anterior ischaemic optic neuropathy

- Most frequent of acute optic neuropathy > 50 years old
- Optic nerve head ischaemia → NAION ? (5-10%)
  → AAION ? (90-95%)



Anterior ischaemic optic neuropathy

AAION

70 years old

W>M

systemic syptoms (80%)

VA <1/10 in (>60% cases)

CRP

↑ ESR 70mm/h

Rare improvement and second eye involved in 50-60% cases w/o TT

IV Corticosteroid therapy emergency (1g/day; 3-5 days)

NAION

60 years old

W=M

CVRF

VA >1/10 (>60 % cases)

CRP normal

ESR 20-40 mm/h

Improvement in 30% cases and second eye involved in 15% cases

No TT

Conclusions

- Many ocular arise with increasing age
- A few may be treated
  - > Depending on the correct diagnosis
  - > Depending on the systemic context