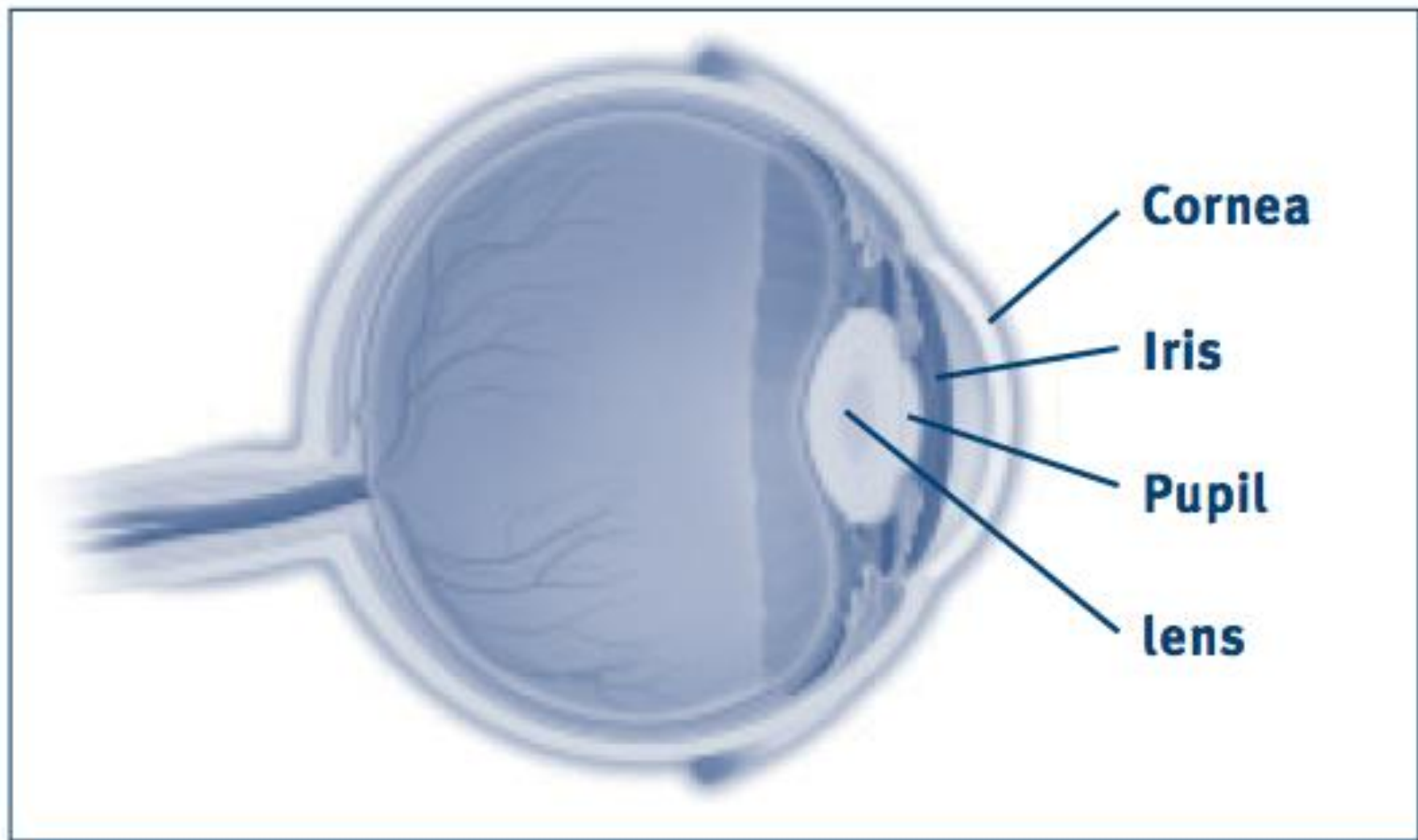


# Corneal diseases

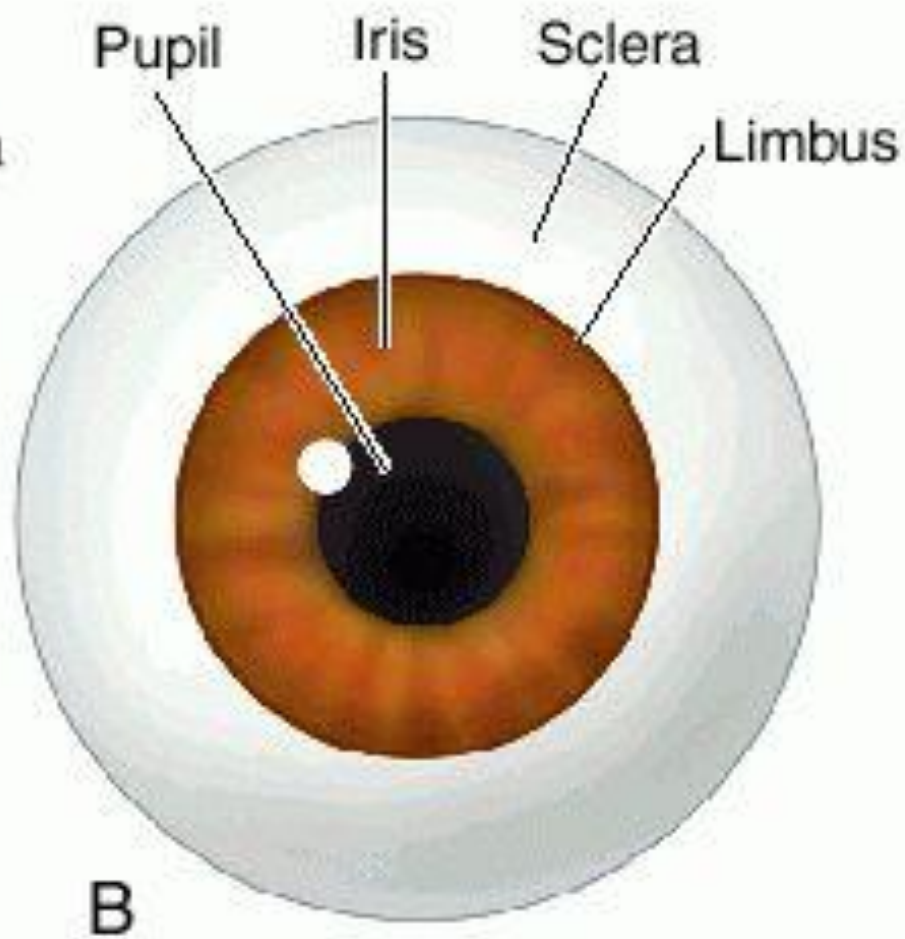
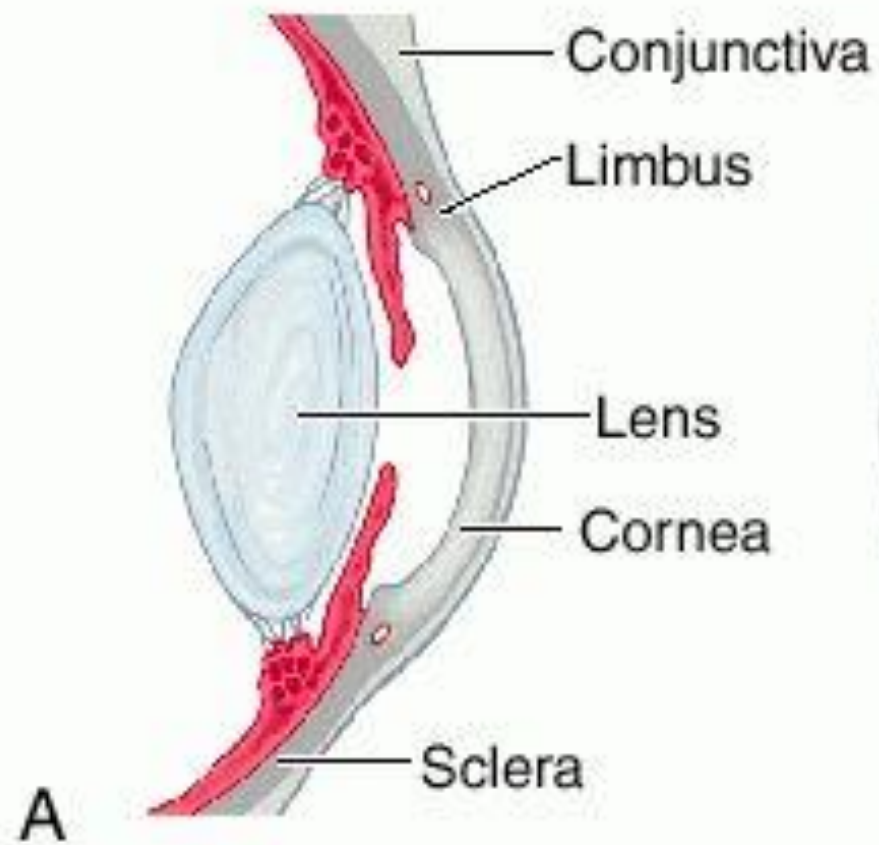
Faramarzi A M.D,  
Labbafinejad Medical Center  
May 2014

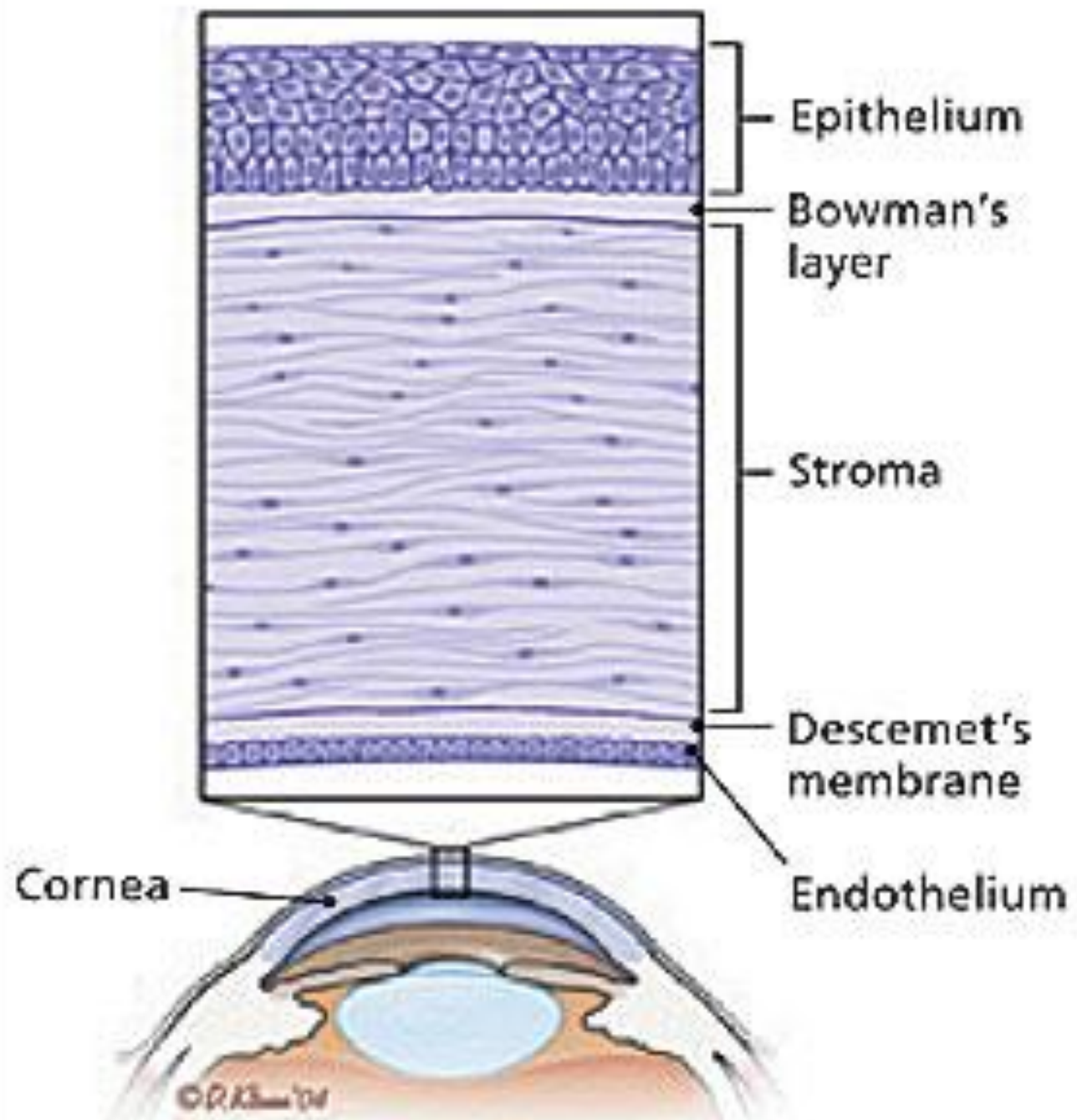
# Anatomy

- Horizontal Diameter: 11-12 mm
- Vertical Diameter: 10-11 mm
- Central Corneal Thickness: 550 micron
- It ends to limbus
- 43 diopter from 58.60 diopter of total eye refractive power



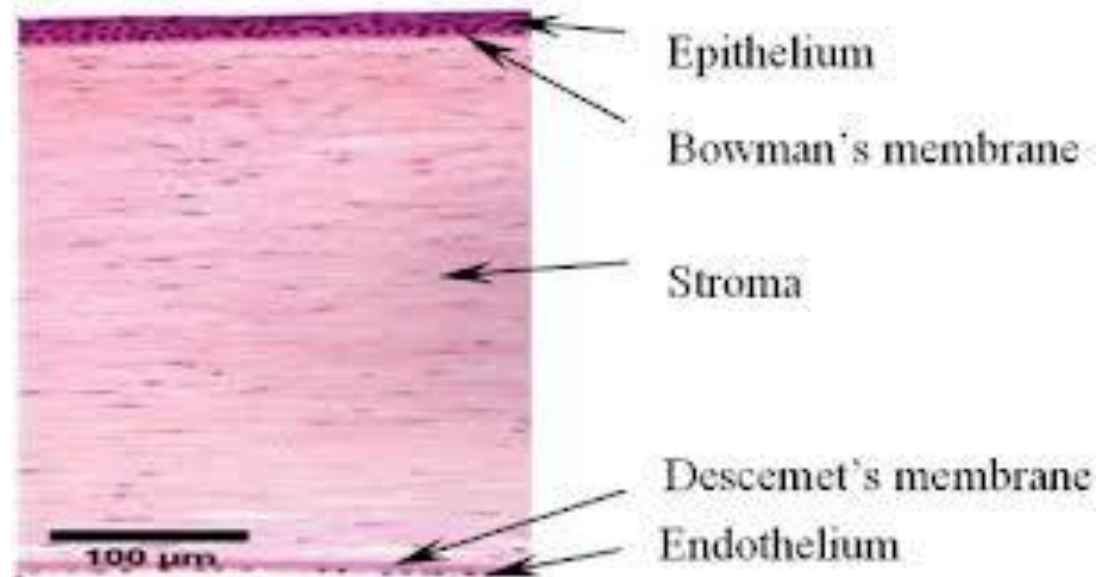
**Normal Eye Anatomy**





# Anatomy

- Five layer
  - Epithelium
  - Bowman's Layer
  - Stroma
  - Descemet's membrane
  - Endothelium



# Corneal epithelium

- 10% of corneal thickness (50 micron)
- 5 to 6 layer
- It creates a regular optic surface
- strong binds between epithelial cells prevent from entrance of microorganisms and tears into the cornea
- Origin of epithelial cells is from limbal stem cells

# Bowman's Layer

- Acellular transparent layer
- It adheres to basement membrane of epithelial cells



# Corneal Stroma

- 90% of corneal thickness
- consists of collagen fibrils, macromolecules, water and keratocytes
- fibrils are parallel to each other

# Descemet's Membrane (DM)

- It is really basement membrane of endothelial cells
- It is 3 micron thick at birth
- It's thickness reaches 10-13 micron

# Endothelium

- Only one cellular layer
- The role is deturgescence and clarity of cornea
- No mitosis
- Decrease with age
- Dysfunction → edema

# Corneal clarity

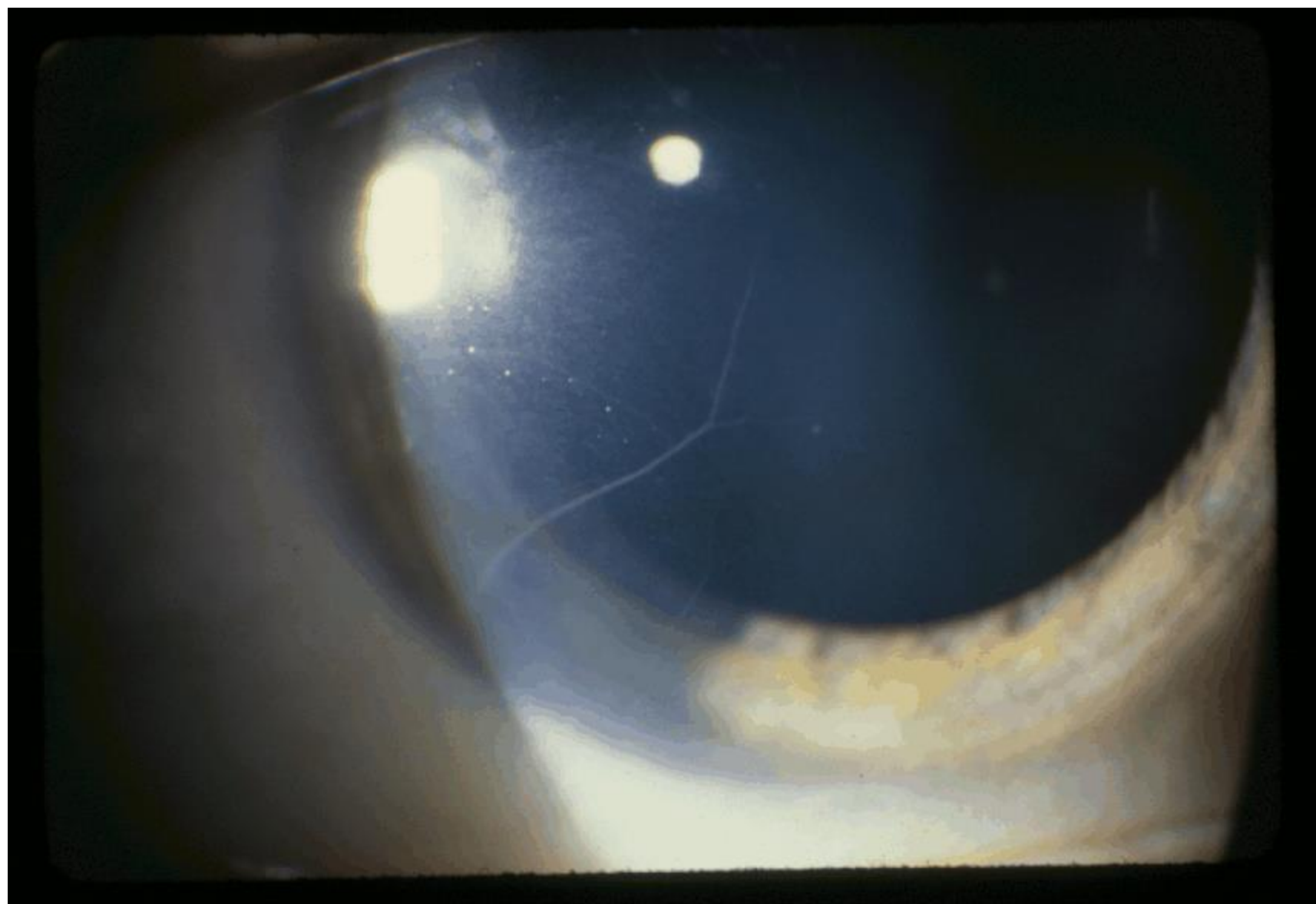
- Parallel collagen fibrills
- No blood vessels
- Endothelial cell pump

# Corneal feeding

- Oxygen from limbal vessels, aqueous humor, tears
- Glucose from aqueous humor

# Sensory Nerves

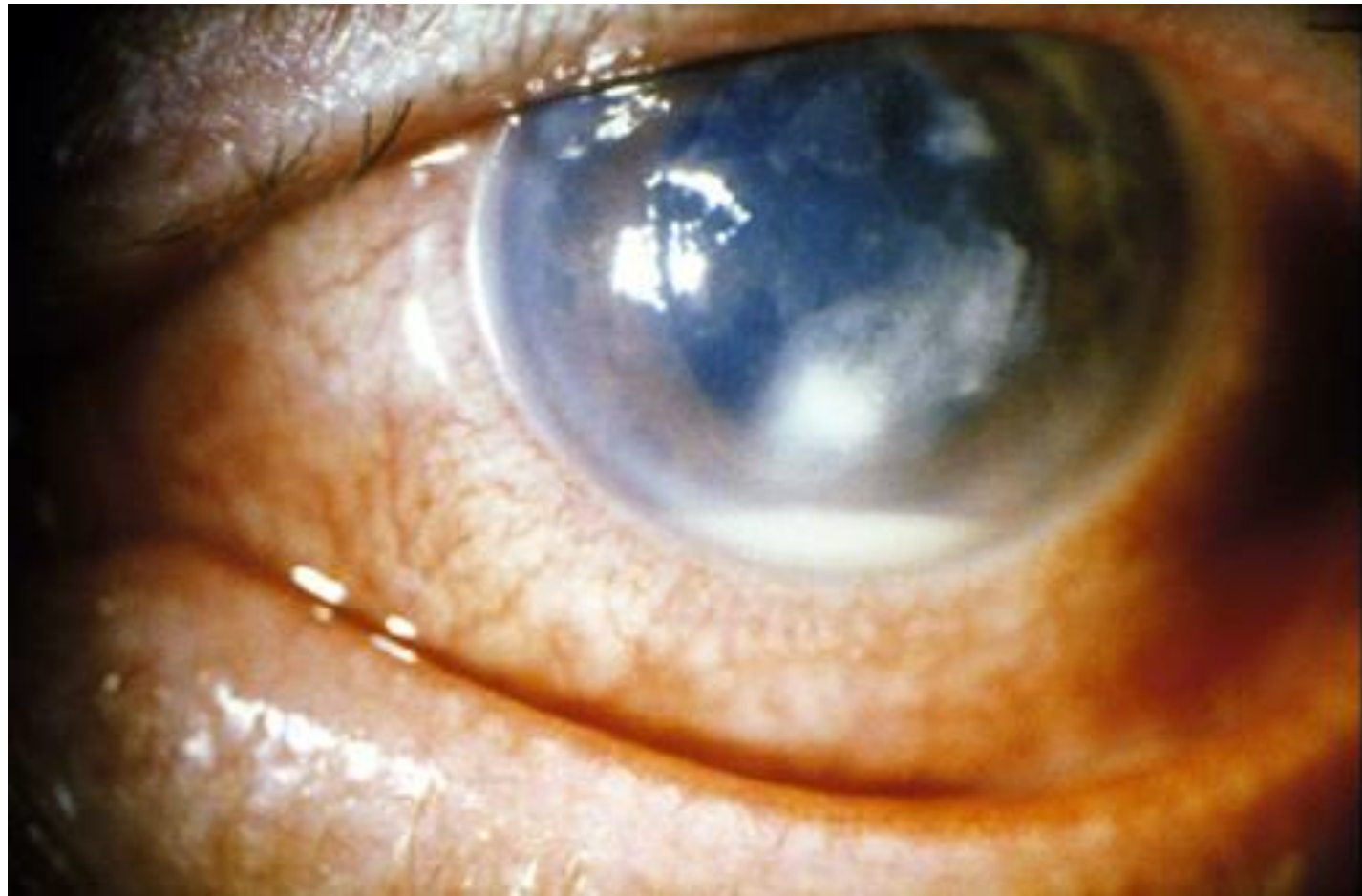
- Ophthalmic branch of trigeminal (5<sup>th</sup>) nerve
- Richest sensory endings



# Corneal Ulcer

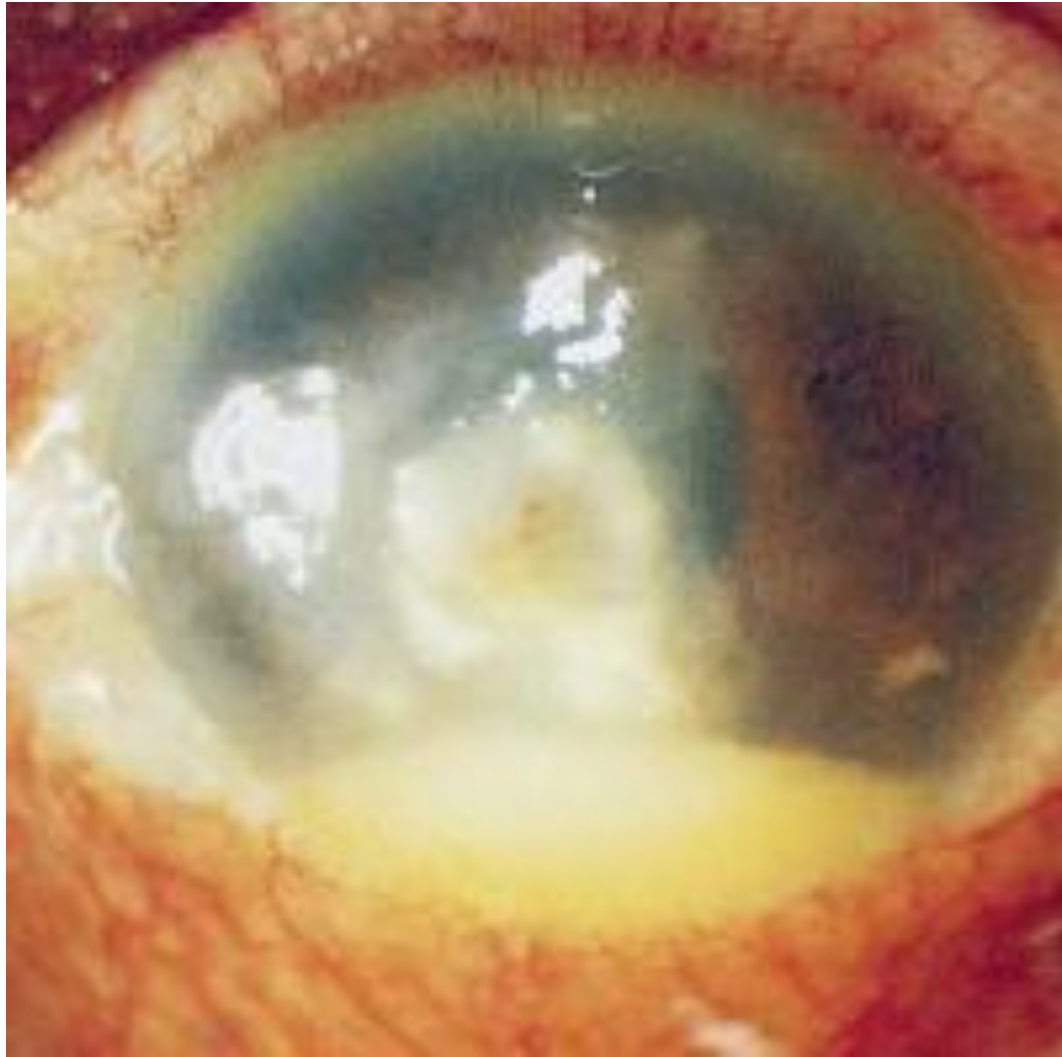
- Inflammation and necrosis of the corneal tissue
  - Due to microorganisms: Bacteria, viruses, fungi, parasites (ameboea)
  - Sterile ( autoimmune, neurotrophic)





# Bacterial Keratitis

- Vision threatening
- Perforation of the cornea



# Risk factors

- Contact lenses ( soft & colored)
- Trauma ( surgery)
- Decrease of corneal sensation
- Dry eye
- Lid deformities
- Diabetes, AIDS
- Eye drops like steroids and anesthocaine

# Bacterias

- G+: streptococcus pneumoniae, Staphylococcus
- G- : pseudomonas aeruginosa ( in contact lens users)



# Symptoms & signs of bac. keratitis

- Pain, redness, photophobia, decreased vision, tearing and mucopurulent discharge
- Conjunctival injection, dense corneal infiltration, corneal epithelial defect, AC reaction +/- hypopyon

# **HYPOPYON CORNEAL ULCER**







# Lab. Exam.

- Direct smear & culture from corneal ulcer
- Culture from lens case & solution

# Treatment

- Urgent
- No wait for results
- Fortified topical antibiotics
  - against G+ : vancomycin, cephazoline
  - against G- : gentamycin, Tobramycin, ceftazidime,
- Broad spectrum: chloramphenicol, ciprofloxacin, levofloxacin, moxifloxacin, gatifloxacin

# Treatment (drops)

- Fortified gentamycin : 9-14 mg/ml  
+ Fortified cephalazoline : 50 mg/ml
- Vancomycin : 50 mg/ml  
+ Ceftazidime : 50 mg/ml
- Every 30 min
- Subconjunctival injection

# Monotherapy

- Flouroquinolones
  - ciprofloxacin, levofloxacin, moxifloxacin, gatifloxacin
- Less than 3 mm
- Peripheral lesions

# Penetrating keratoplasty

- Progressive infection with impending scleral involvement
- Corneal perforation

# Viral keratitis

- Herpes simplex virus keratitis
- HSV-1
- HSV-2
- Primary infection:
  - unilateral blepharoconjunctivitis
  - follicular conjunctivitis
  - periocular adenopathy
  - lid skin or lid margin follicles





# Differential Diagnosis

- Adenovirus or epidemic keratoconjunctivitis EKC
  - vesicles on lid skin or lid margin
  - dendritic epithelial keratitis
  - Conjunctival membrane or pseudomembrane
  - unilaterality
- Lab exam
  - culture
  - PCR

# Treatment

- Self-limited
- Trifluridine: TFT 1% q3h for 10 days
  - pyrimidine analoge which inhibits DNA polymerase
- Acyclovir: 3% oint & 200 & 400 mg tab
  - Treatment dose: 2gr/day
  - Prophylactic dose: 800 mg/day

# Herpetic recurrent infection

- Dormant virus in trigeminal ganglion goes to the corneal nerves through axones
- Emotional & physical stresses
- Sun exposure
- Menstrual cycles
- Contact lenses
- Systemic infections

# Recurrent herpetic infections

- Blepharconjunctivitis
- Epithelial keratitis
- Stromal keratitis
- Endothelial keratitis
- iridocyclitis

# Blepharoconjunctivitis

- No differentiation from primary
- Self limited
- Antiviral lessen the duration of the disease

# Epithelial keratitis

- Foreign body sensation, photophobia, redness & decreased vision
- Dendritic keratitis with terminal bulbs
- Staining with fluorescein, rose bengal
- Geographic
- Decrease of corneal sensation







# Dendritic keratitis

- Adenovirus
- Epstein- Bar virus
- Healed epithelial defect
- Neurotrophic keratitis
- Contact lens wear
- Topical antiviral
- Acanthameoba keratitis

# Diagnosis

- Based on slit lamp exam
- Culture
- PCR

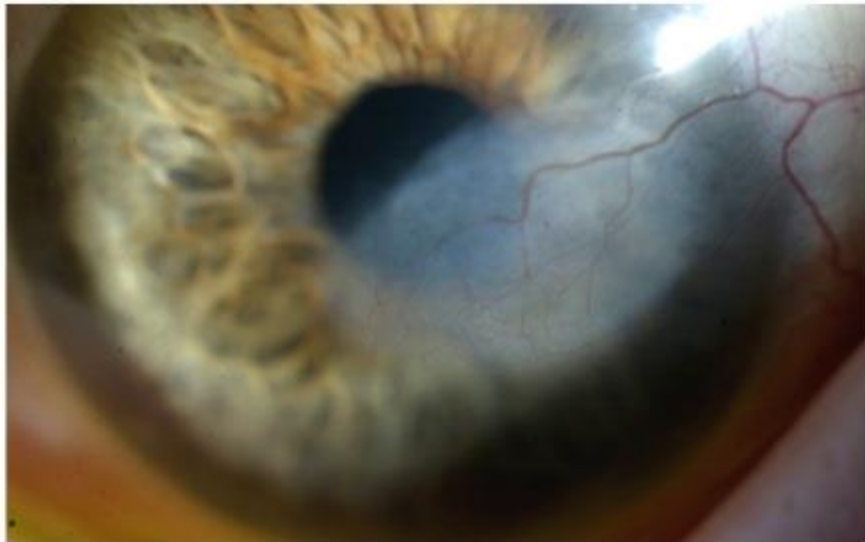
# Epithelial recurrent HSK

- TFT 1% q3h for 10-14 days
- Acyclovir oint 3%
- Oral acyclovir 2 gr/day 2-3 weeks
  - no epithelial toxicity
- No topical steroids

# Stromal HSK

- Non-necrotizing: interstitial
  - Mild infiltration +/- vascularization
  - No epithelial defect
- Necrotizing
  - Dense infiltration
  - Tissue loss
  - Epithelial defect

Figure 1



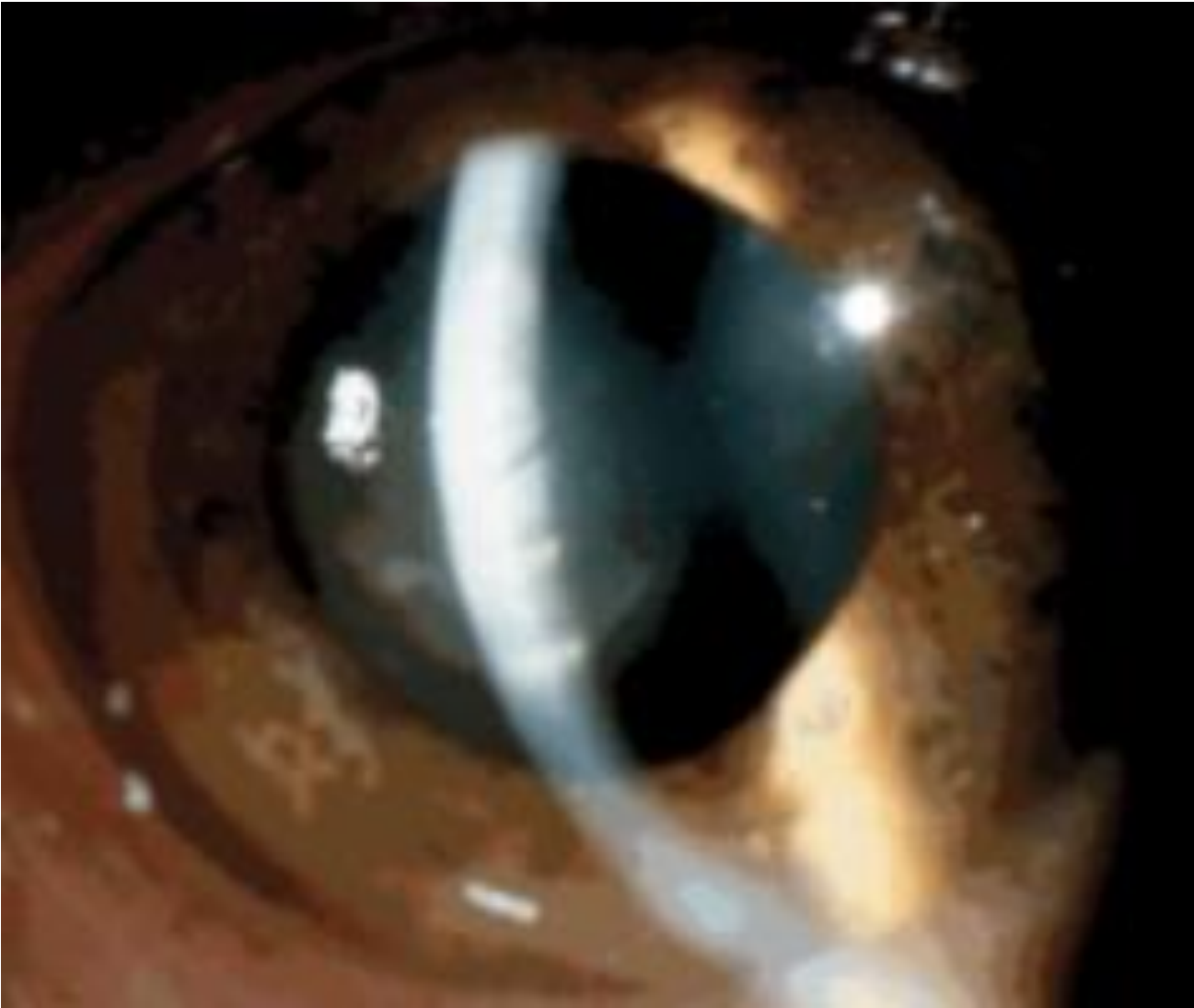




# Endothelial HSK

- Disciform keratitis
- Localized edema
- Keratic precipitate (KP)
- AC reaction
- No stromal infiltration









# Herpetic iridocyclitis

- AC reaction
- KPs
- High IOP
- With or without stromal keratitis
- Live viruses

# Treatment of Stromal, Endothelial & Herpetic iridocyclitis

- Topical +/- systemic steroids 2-4 times / day
- Acyclovir 800mg/day for prevention of recurrence( Prophylactic dose)

# Varicella Zoster

- Primary infection : chickenpox
  - ocular involvement: follicular conjunctivitis, lid vesicles
- Secondary infection: Zoster, Zona
  - Involvement of Ophthalmic branch of trigeminal nerve

# Herpes Zoster Ophthalmicus : HZO

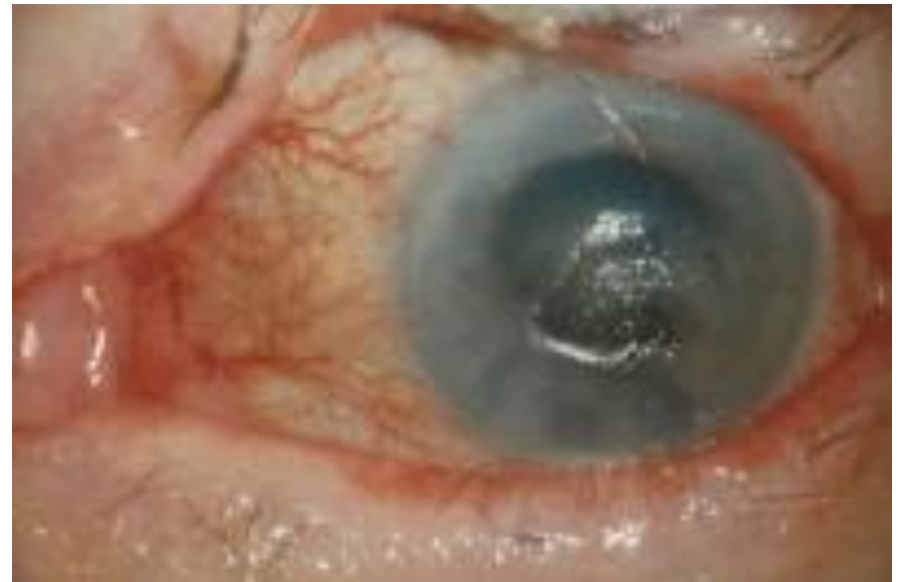
- 6-9 decades of age
- Immunosuppression
- Malignancy
- HIV
- Mostly normal patients





# HZO

- Vesicular dermatitis
- Painful & Hyperesthetic dermatome
- Conjunctivitis, episcleritis, scleritis, keratitis (dendritic), iridocyclitis, sectorial iris atrophy  
high IOP, papillitis
- Postherpetic neuralgia



# Treatment

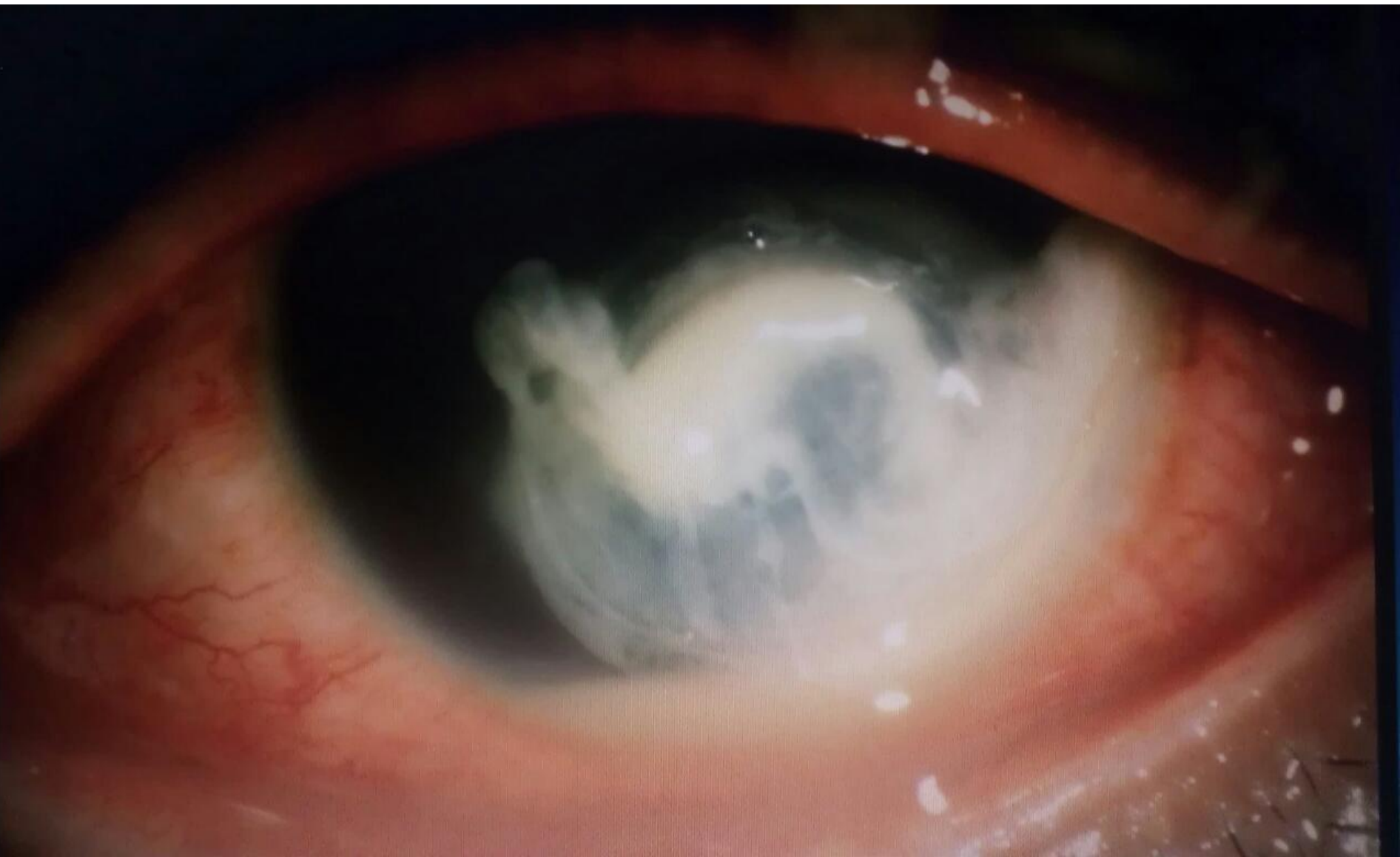
- Acyclovir 4 gr/day for 10 day in early 72 hour
- Topical steroids + cycloplegics
- Topical antibiotics for skin lesions
- Systemic steroids, Gabapentin, amitriptyline  
carbamazepin

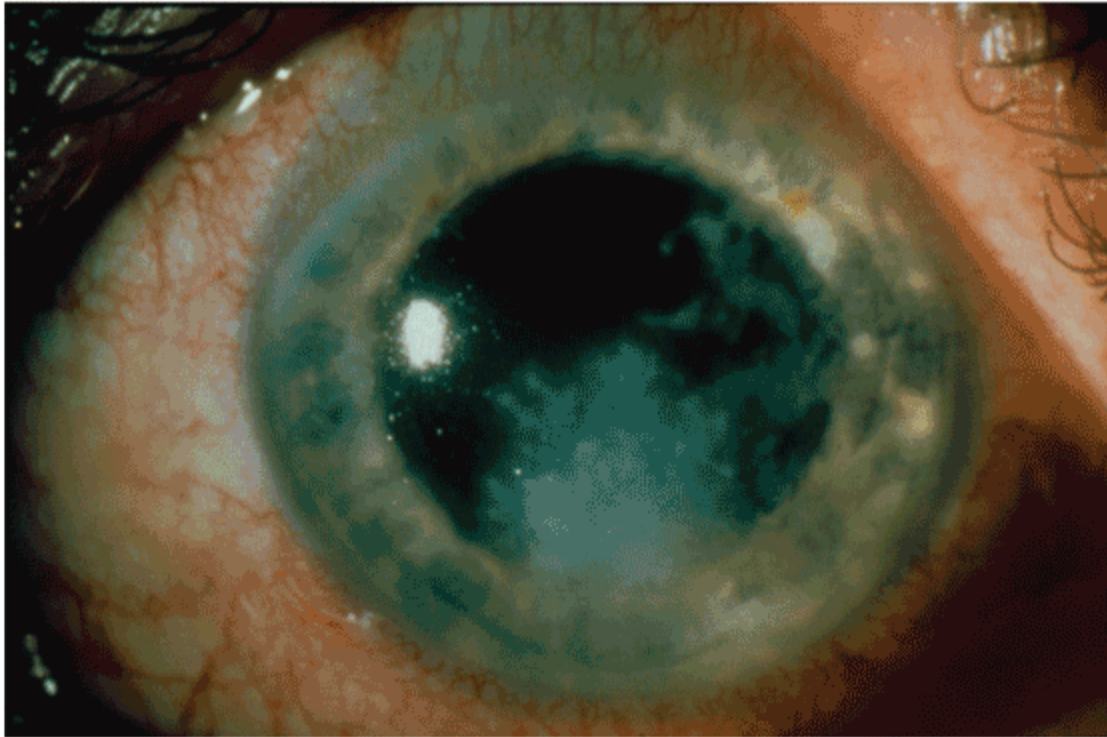
# Fungal keratitis

- Less common
- Risk factors: trauma(plants) in farmers  
contact lenses, steroids, corneal sugery (Lasik, Lasek, PKP, herpetic keratitis, hot & moist weather

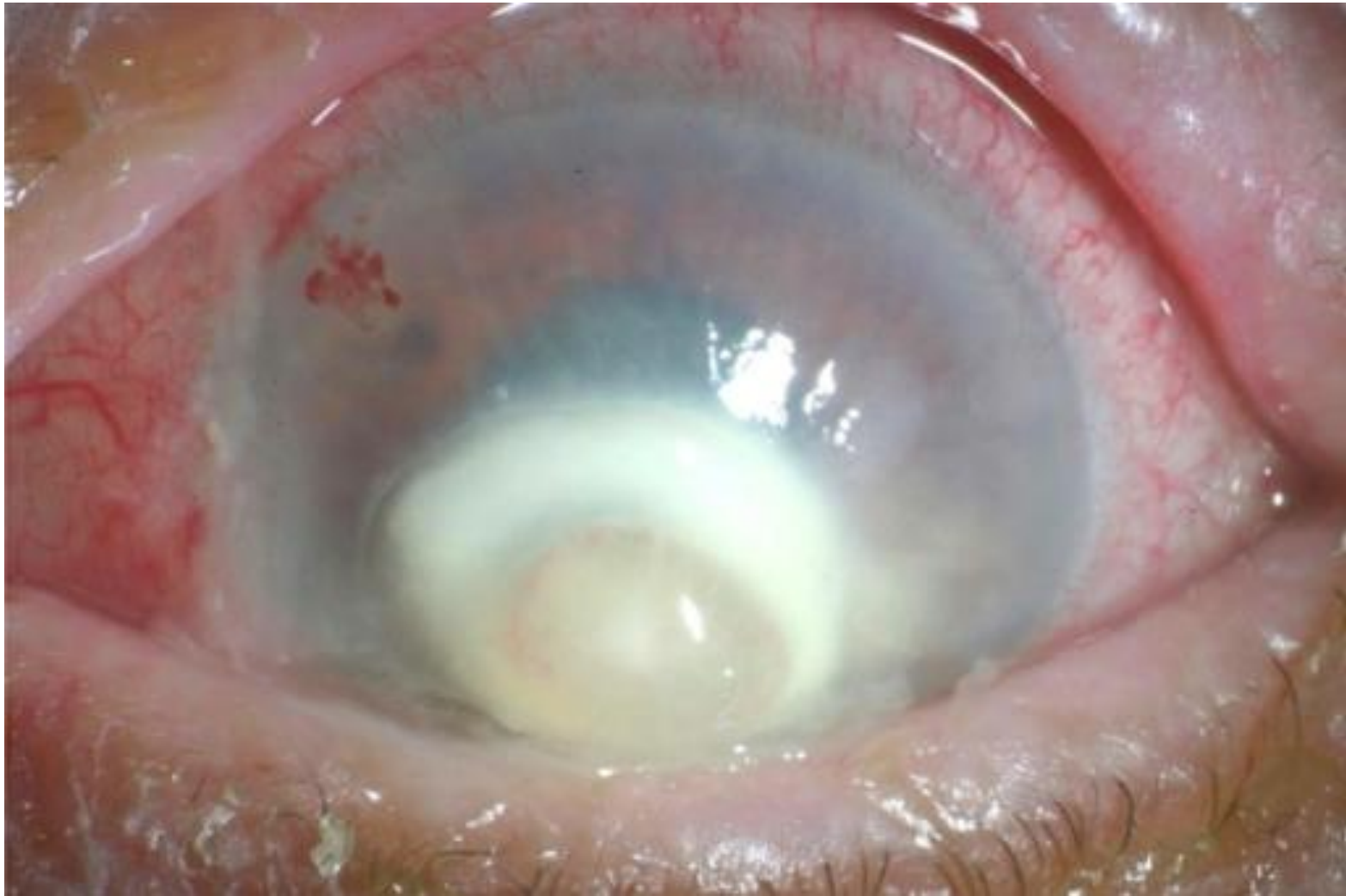
# Fungal Keratitis: symptoms & signs

- Less symptoms compared with bacterial
- Less injection of conjunctiva
- Feathery like irregular infiltration with satellite lesions
- Filamentous ( fusarium, aspergillus) or Mold (candida)





**Filamentous fungal keratitis often consists of a grayish infiltrate with a filamentous or feathery edge.**



# Diagnosis

- Smear (Gram, Geimsa, KOH) & culture ( blood agar, Sabouraud's dextrose agar)
- Confocal microscopy



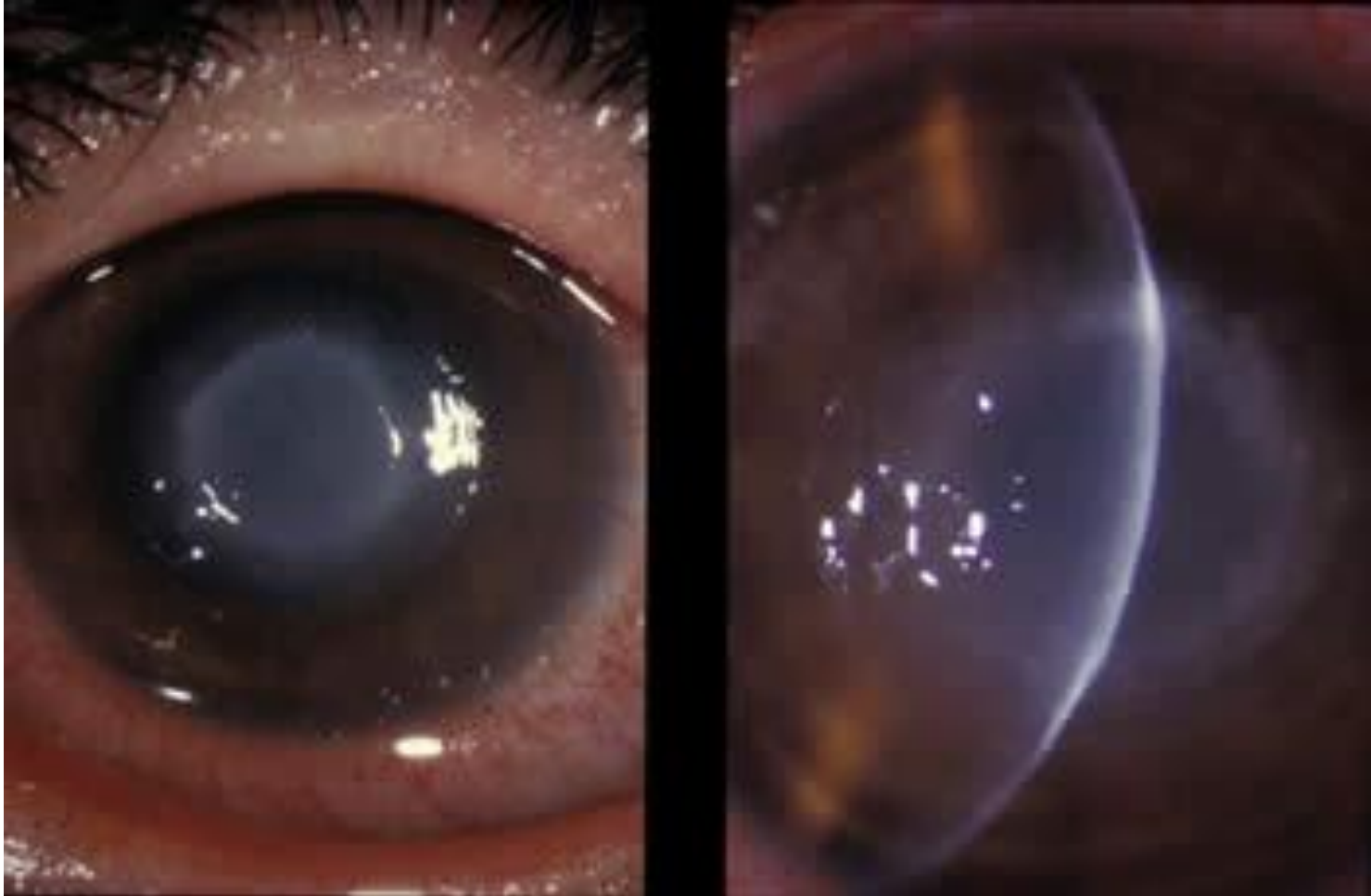
# Treatment

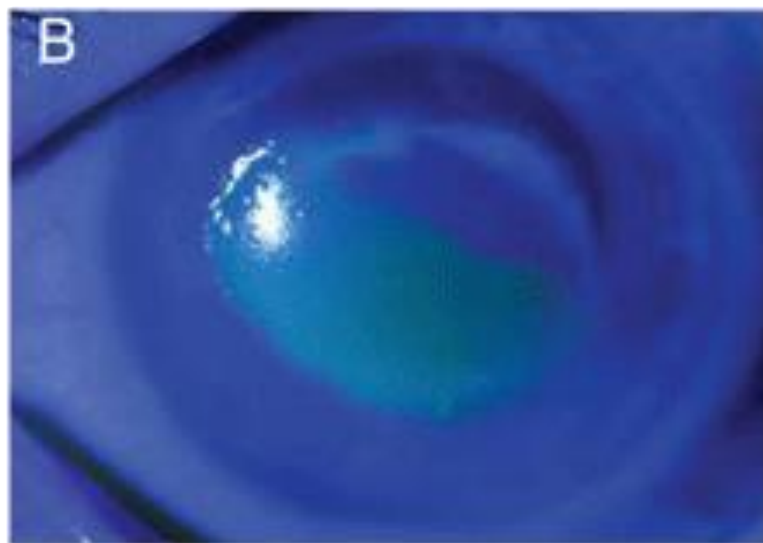
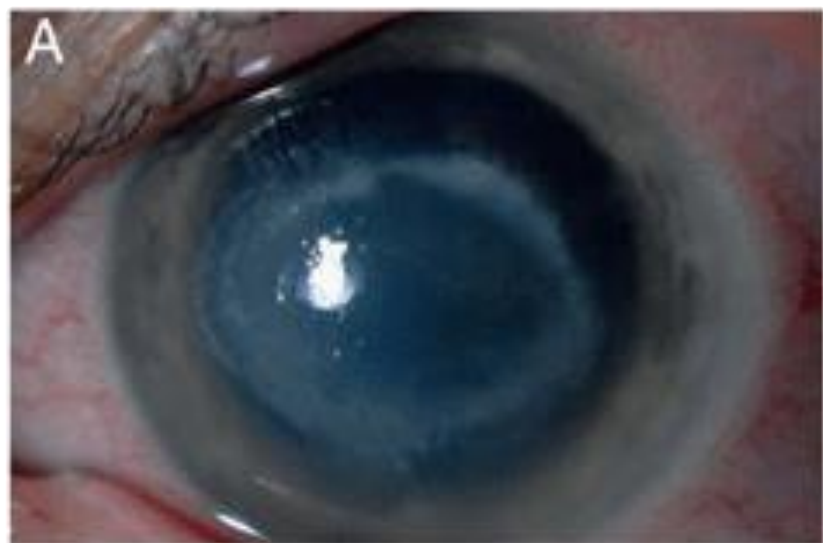
- Topical: Natamycin 5%, Amphotericine B 0.15-0.3%, Voriconazole q 1h
- Systemic: ketoconazol, fluconazole, voriconazole
- Surgical: debridement, PKP, conjunctival flap

# Acanthamoeba Keratitis

- Parasites
- In soil & tap water
- Resistance to drying, freezing , chlorine in tap water & swimming pools
- 70% due to contact lenses

# Acanthamoeba keratitis









# Symptoms & signs

- Severe pain & photophobia
- First limited to epithelium like dendrite in HSK
- Then stromal infiltration ring shaped
- Radial keratoneuritis

# Dx

- Smear: Trophozoite
- Culture: culture from corneal scraping and lens solution & lens case
- Confoscan



# Treatment

- Lens discontinuation
- PHMB drop
- Brolene ( propamidine 0.1%) drop
- Chlorhexidine drop
- Ketoconazole tab
- No steroids drop
- PKP in unresponsive cases or for visison

# Ectatic disorders

- Keratoconus: KCN
  - degenerative, progressive corneal disorder
  - Central or paracentral thinning or bulging
  - familial, eye rubbing in allergic eyes
  - cornea changes to cone-like
  - incidence in IRAN is 15/1000 & in USA 1/2000

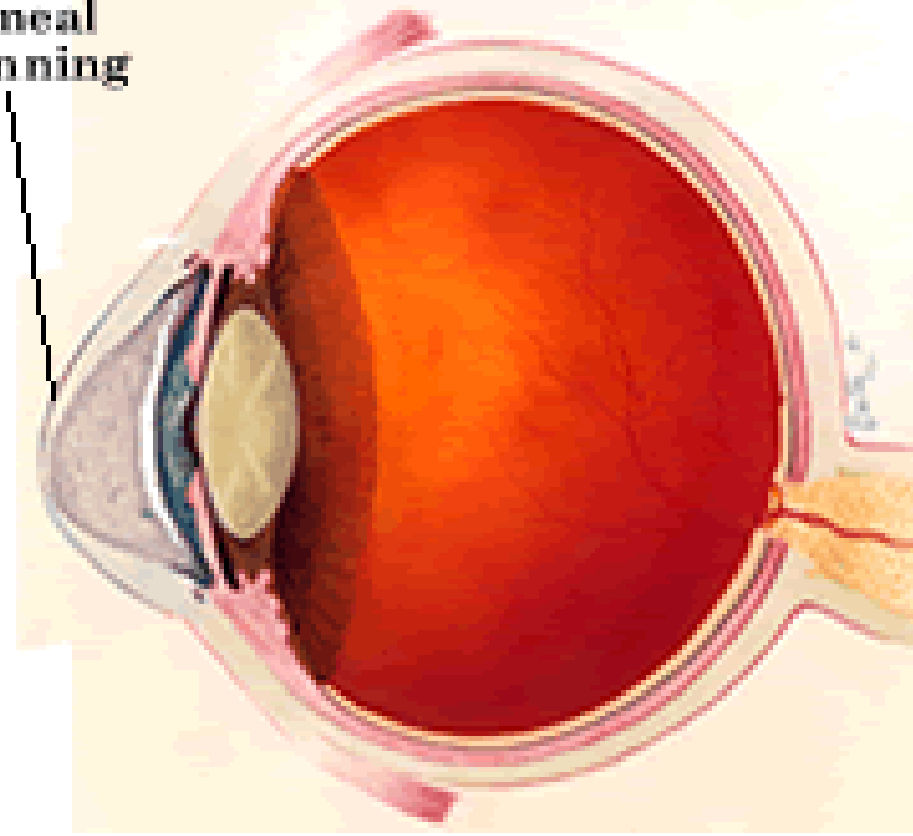




**Normal Cornea**

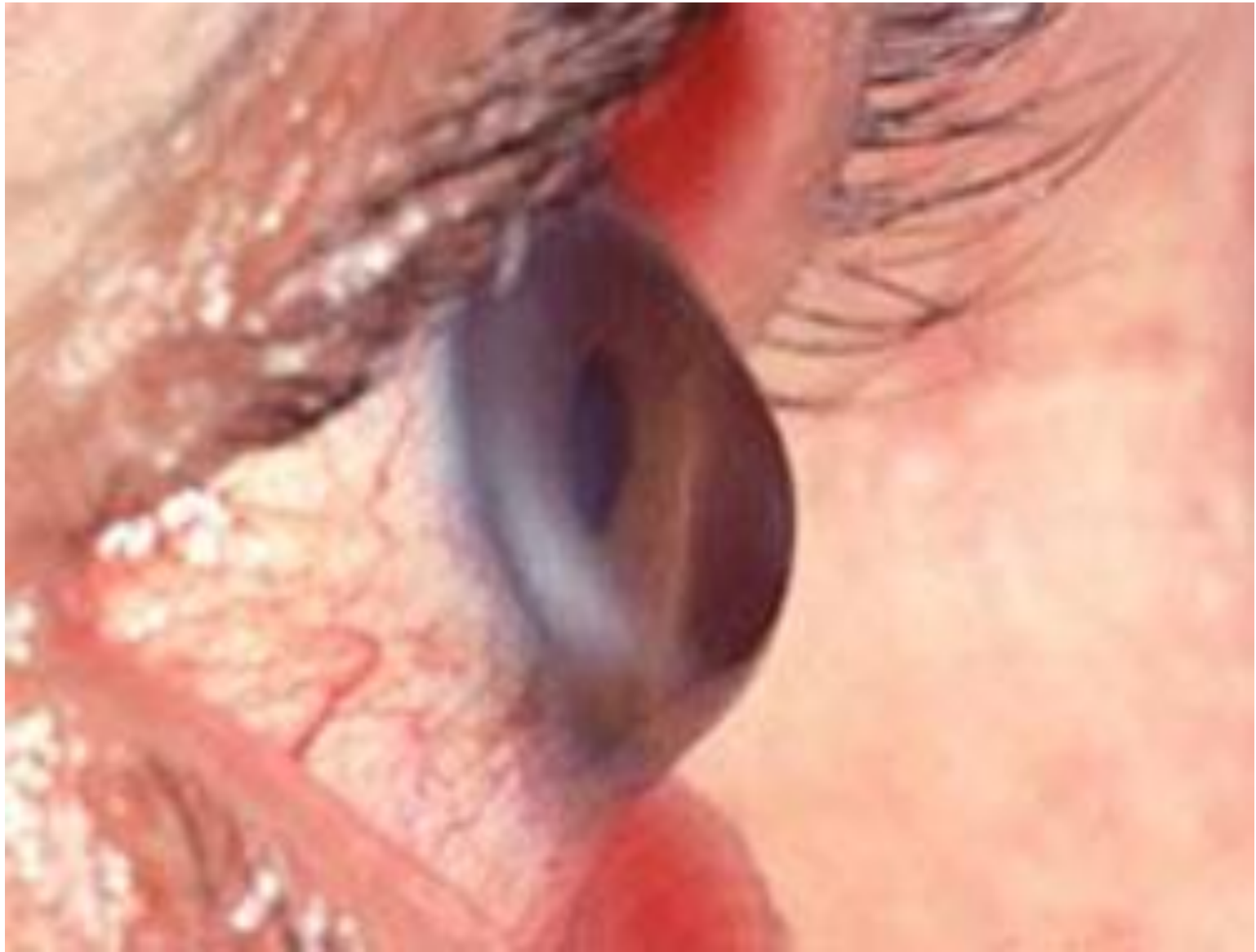
*Source: National Eye Institute*

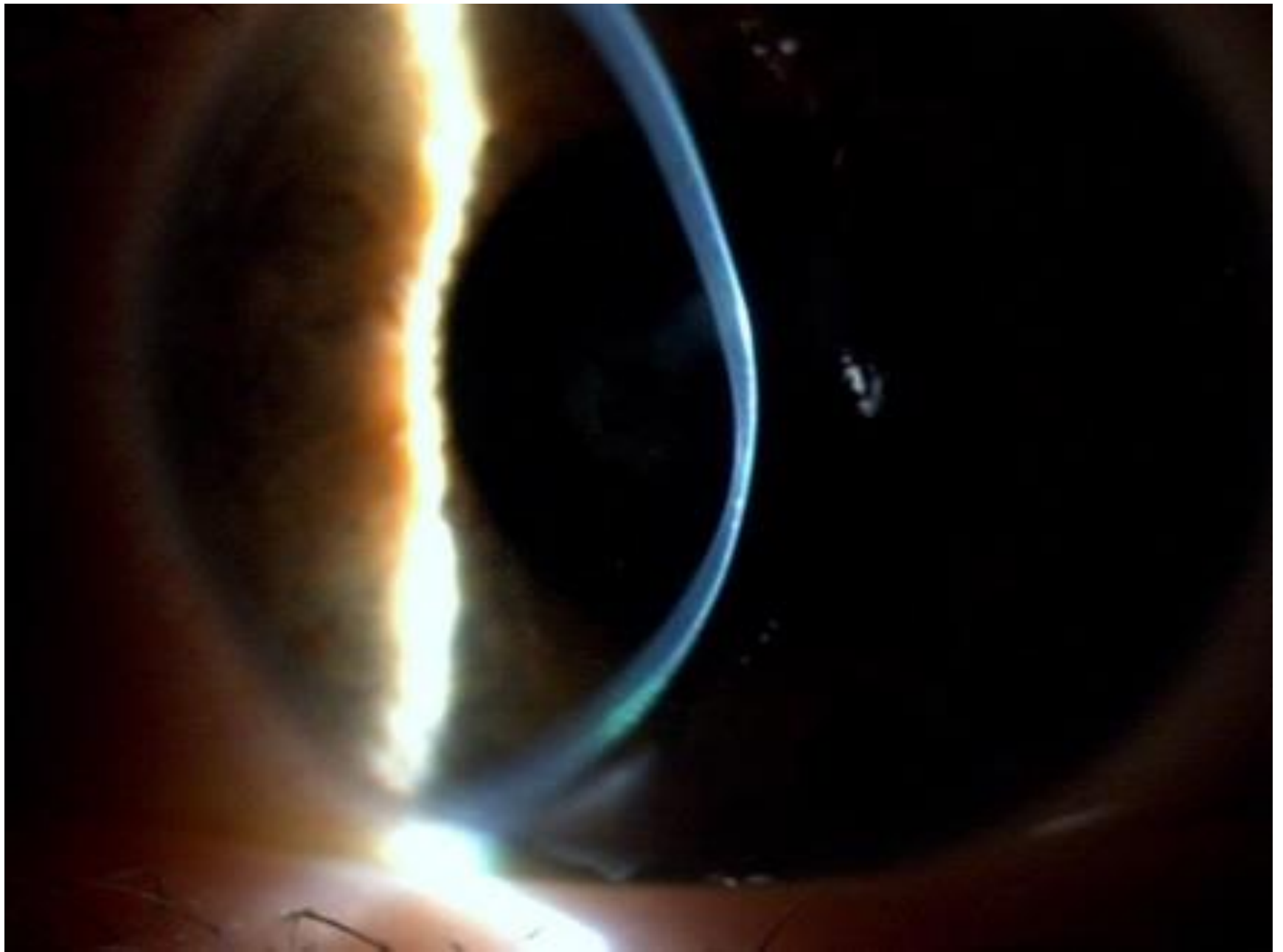
**Corneal Thinning**



**Keratoconus**

*Source: NEVELIO Spinello, MPH, EdD*



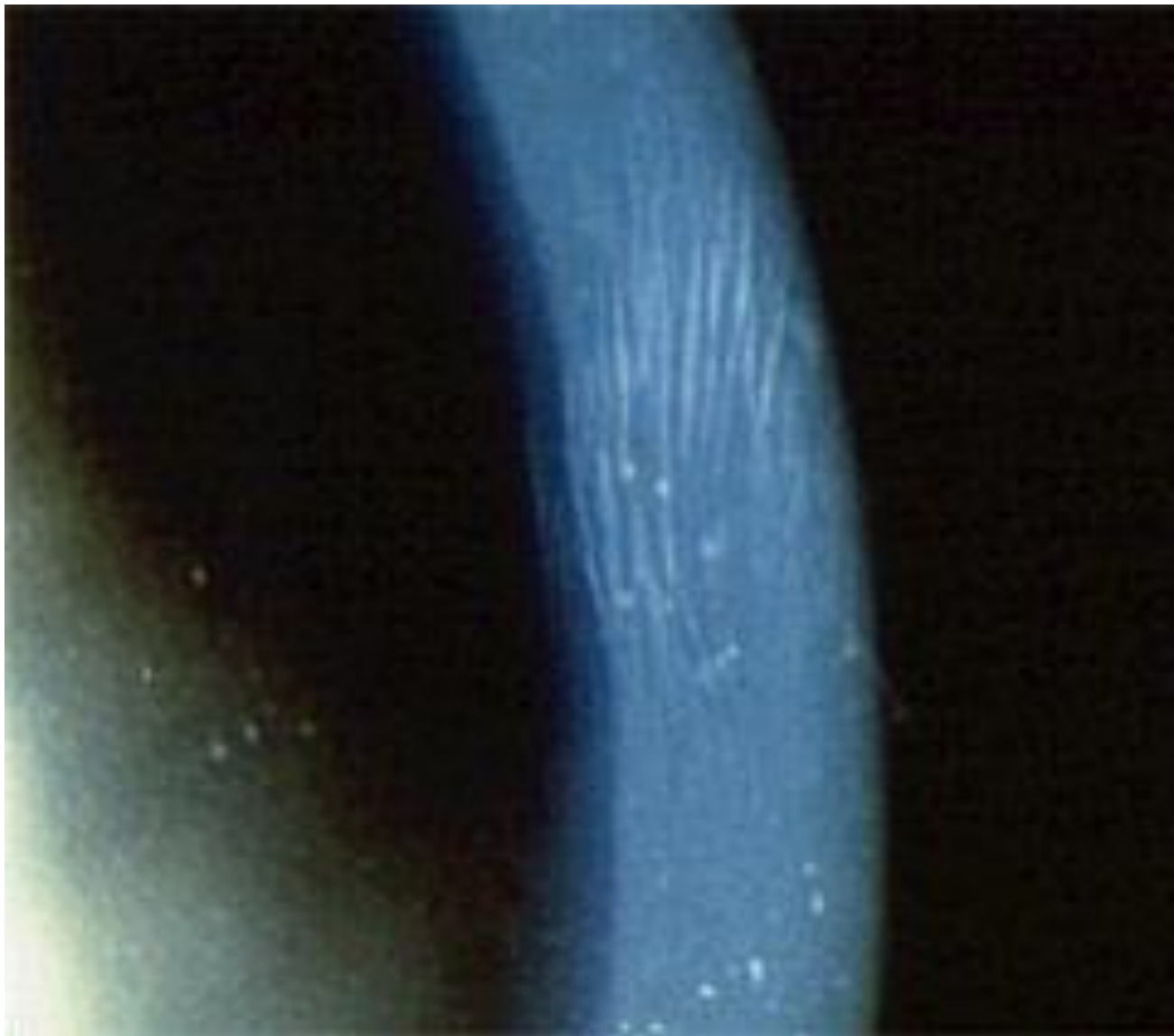


# Pathology

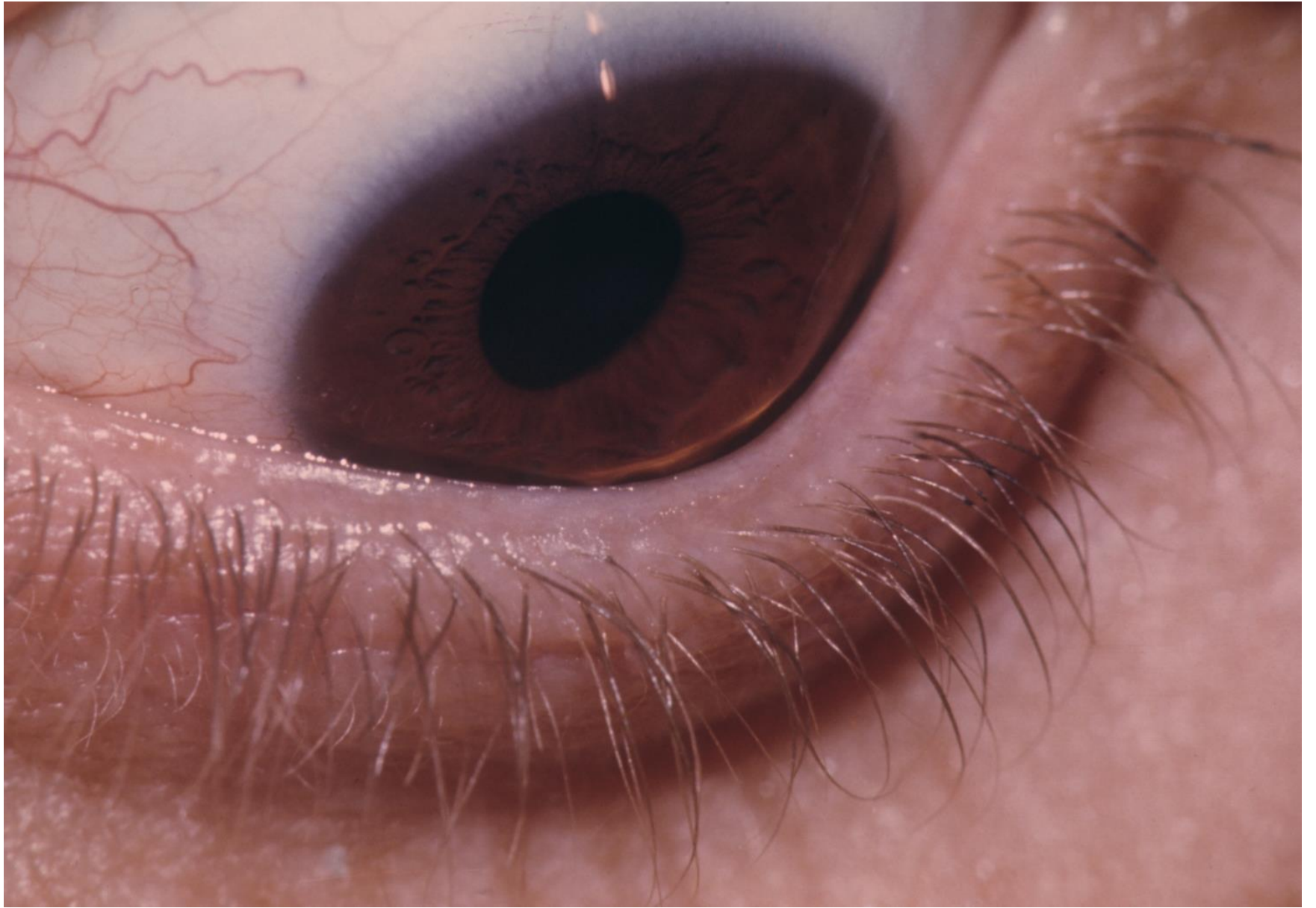
- Fragmentation of Bowman's layer
- Stromal thinning & scar
- Descemet's striae ( Vogt's striae)

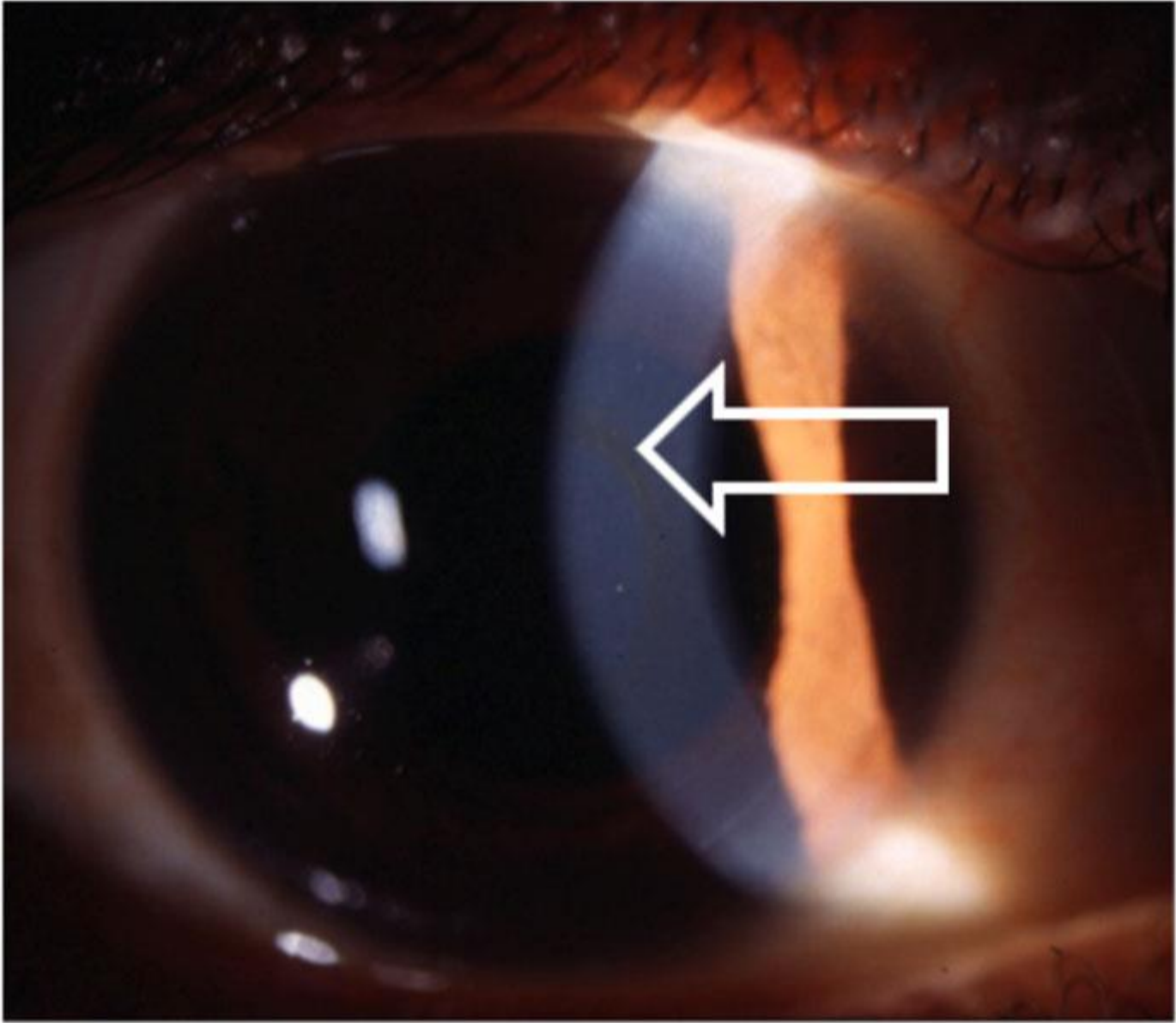
# Symptoms & signs

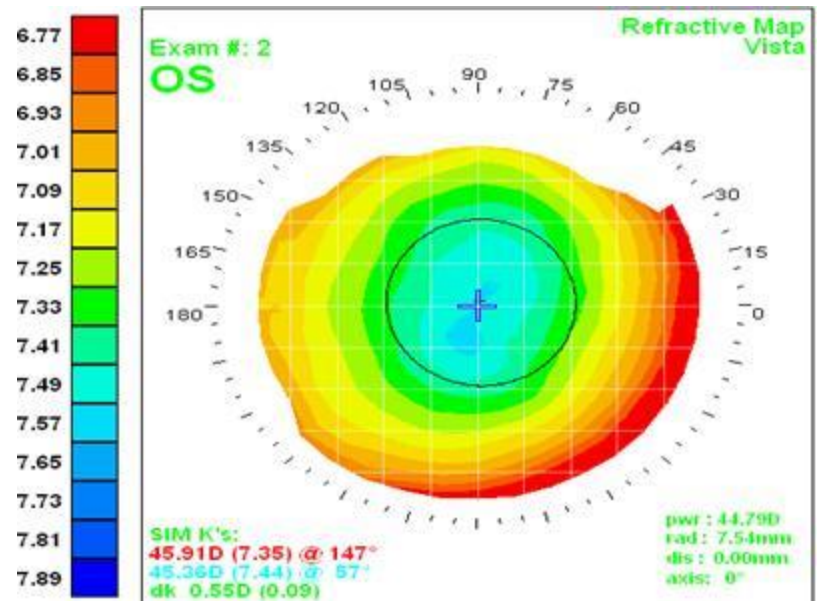
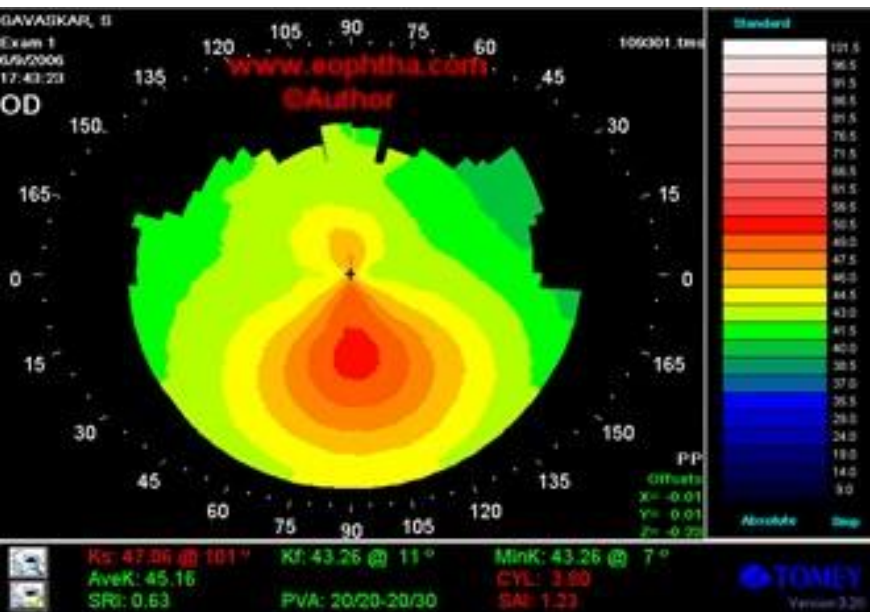
- Decrease of VA in adolescence
- Bilateral but asymmetric
- Progressive until 4<sup>th</sup> decades
- Scissor reflex in retinoscopy
- Munson's sign
- Fleischer ring
- Vogt's striae
- Hydrops or acute corneal edema due to perforation of DM which improves after a couple of weeks and mostly changes to scar that may improve vision











# Accompanying diseases

- Down's syndrome, Marfan's syndrome, atopia, mitral valve proplapsus

# Dx & Treatment

- Clinical exam
- Corneal topography
- Mild cases: Glasses
- Moderate cases: Hard contact lenses. Intracorneal ring segments (ICRS)
- Severe cases: PKP or DALK ( deep anterior lamellar keratoplasty)
- For stabilization : corneal collagen cross-linking (CCL or CXL)
  - removing of corneal epithelium and instillation of riboflavine (B2) drops for 30 min and UVA (365-375 nm) for 30 min

