CORNEA

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THE CORNEA

GROSS ANATOMY

- Anterior 1/6 of outer coat
- Curved & Domshaped
- Diameter : Horizontal 12mm
- Vertical 11mm
- Thickness: Central 0.5 - 0.6mm
- Peripheral 0.8 – 1.0mm
- Radius of Curvature : Anterior 8 mm
- Posterior 7 mm
- Refractive Index : 1.37
- Refractive Power : 42 D
- LIMBUS ,SULCUS SCLERAE

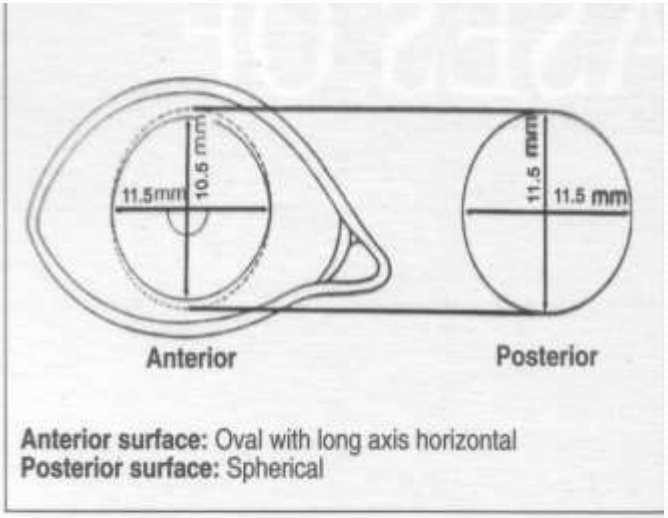


Fig. 4 (7)
Corneal diameters (anterior and posterior surfaces).

LAYERS

(1) Epithelium

St. Squamous Nonkeratinised (5-6 layer

Surface Flat cells (2-3 layers)

Intermed. Polyhedral cells (2-3 layers)

Basal Columnar cells (one layer)

(2) Bowman's layer

Structure less (Acellular) condensation

Never regenerate

Ends as a round border

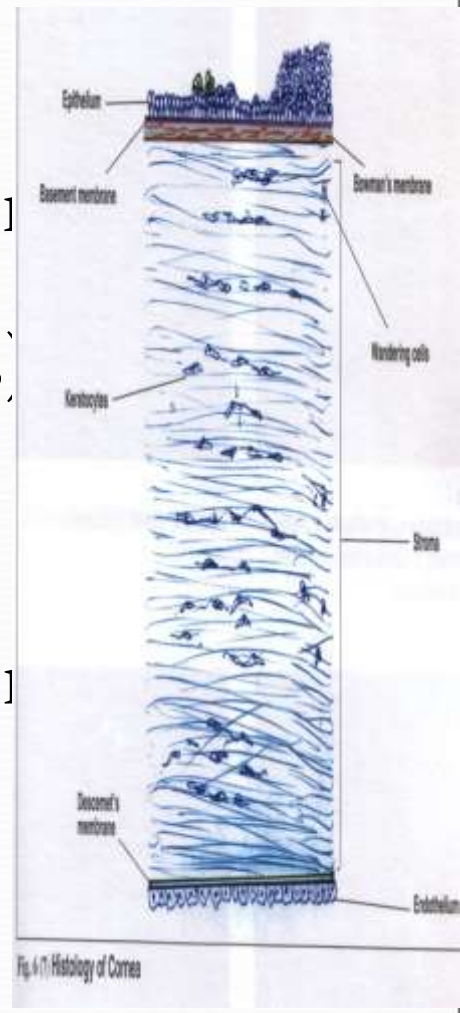


Fig. 4.17: Histology of Cornea

(3) The stroma(Substantia Propria)

- 90% of corneal thickness
  (Regular arrangement)
  - Bundles of each layer \\ to each other
    perpendicular to next layer
  - Cells (present in Lacunae)
    Corneal corpuscles (Keratoblasts)

(4) DESCEMET'S MEMBRANE
Homogenous,
Structureless
Highly Elastic
Resistant & Easily Regenerate

CORNEAL ENDOTHELIUM

One Layer of Polyhedral cells

NERVE SUPPLY OF THE CORNEA

5TH Cranial Nerve- OPHTH. division

NASOCILIARY N → Long CILIARY N

SUBEPITHELIAL AND

INTRAEPITHELIAL PLEXUSES

CORNEAL PHYSIOLOGY

NUTRITION
(cornea is avascular)

By diffusion
Tear Film Aqueous humour Limbal capillaries

CORNEAL TRANSPARENCY

Anatomical Factors :

Cornea is avascular

Epithelium is nonkeratinized

Stromal lamellae are regular

Nerves are nonmyelinated

Precorneal tear film

Physiological Factors :

Corneal dehydration

Uniform refractive indices of corneal tissue

FUNCTIONS OF THE CORNEA

- Refractive 42 D
- Protective (corneal reflex),UV rays, infective organisms,
- Transmission of light
- Structural integrity

KERATITIS

(KERATOS -CORNEA , iTiS - INFLAMMATION)

CLASSIFICATION BASED ON DEPTH

SUPERFICIAL KERATITIS — Suppurative (Corneal Ulcer)- bacterial and fungal corneal ulcers

NonSuppurative –viral ,allergic, chlamydial

a)diffuse

b)punctate

INTERSTITIAL KERATITIS — Suppurative (Central Abscess)

NonSuppurative (Diffuse or Local)

DEEP KERATITIS — Suppurative (Post Abscess or Ulcer)

NonSuppurative (disciform keratitis)

Etiological Classification

- Inflammatory
  - Bacterial
  - Viral
  - fungal
  - Parasitic –acanthamoeba
  - Chlamydial
  - Spirochaetal
- Traumatic-chemical ,thermal,mechanical injury
- Allergic Keratitis
  - Phlyctenular keratitis
  - Vernal keratitis
  - Atopic keratitis

Contd.

- TROPHIC KERATITIS
  - Exposure keratitis
  - Neuroparalytic keratitis
  - Keratomalacia
  - Atheromatous Ulcer

- IDIOPATHIC KERATITIS
  - Mooren's Corneal Ulcer
  - Superior limbic keratoconjunctivitis
  - Thygseon's superficial punctate keratitis

Classification of corneal ulcer

- Depending on location
  - Central
  - Peripheral
- Depending on hypopoyon
  - Simple Corneal Ulcer
  - Hypopyon Corneal Ulcer
- Depending on Depth
  - Superficial
  - Deep
  - Impending perforation
  - Perforated

SUPPURATIVE KERATITIS (CORNEAL ULCERS) (ulcerative keratitis)

DEFINITION

Localized Necrosis of Sup. Stroma with destruction of overlying Epith.

ETIOLOGY

Predisposing Factors

Precipitating Factors

Causative Organisms

Predisposing Factors

Local

a) Trauma

- Abrasion (Gono & Diph can invade normal epithelium)
- FB ,trichiasis, tear film disorder,entropion , CL

b) Loss of corneal sensations

c) Ocular causes *(xerosis, A deficiency, Lagoph.)*

d) Prolonged use of Steroids

e)bullous keratopathy,any long standing corneal oedema

f)Neuroparalytic keratitis

General

malnutrition

Diabetes

Pregnancy

Liver & Renal Failure

PRECIPITATING FACTORS

Infection of nearby structures

CAUSATIVE ORGANISMS

a) Bacterial e.g. Neisseria Gonorrhoea,. Neisseria meningitidis,Corynebacterium diptheriae through intact epithelium invade cornea.

Staph aureus, Streptococcus pneumoniae,pseudomonas,proteus , klebsiella

b) Fungal

c) Viral e.g. Herpes Simplex and Zoster,,

d) Acanthamoeba (C.L.)

PATHOLOGY OF CORNEAL ULCERS

Stage of Infiltration

Inflammatory reaction

Grey disc shaped area - Oedema - Ciliary injection

Stage of ulceration

A) Progressive unclean Stage

Necrotic area with irregular Edge
Surrounded by Dense reaction

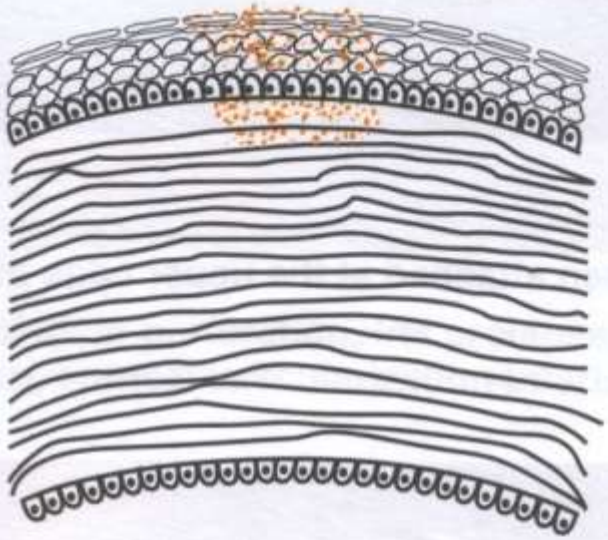
B) Regressive Clean Stage

Large ulcer with regular Edge

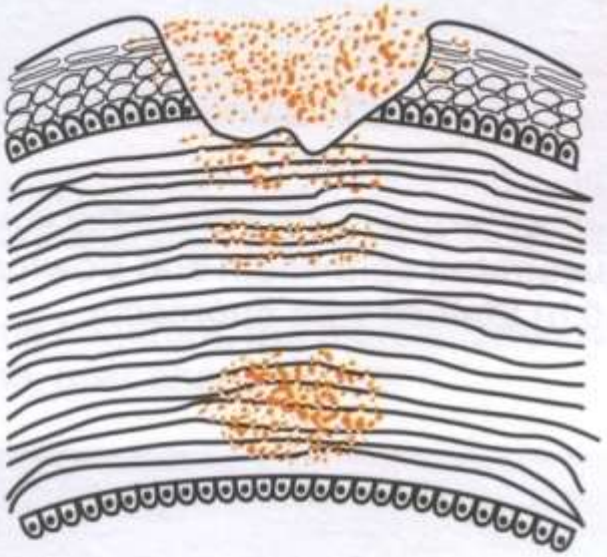
Deep, Clear, Transparent Floor

Less infiltration

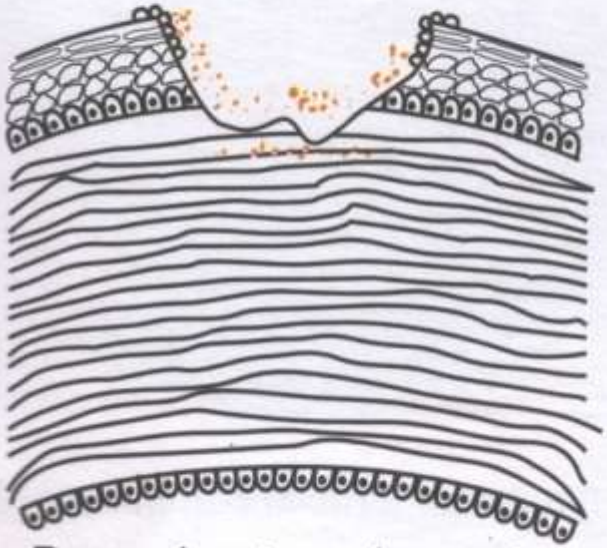
stage of cicatrization



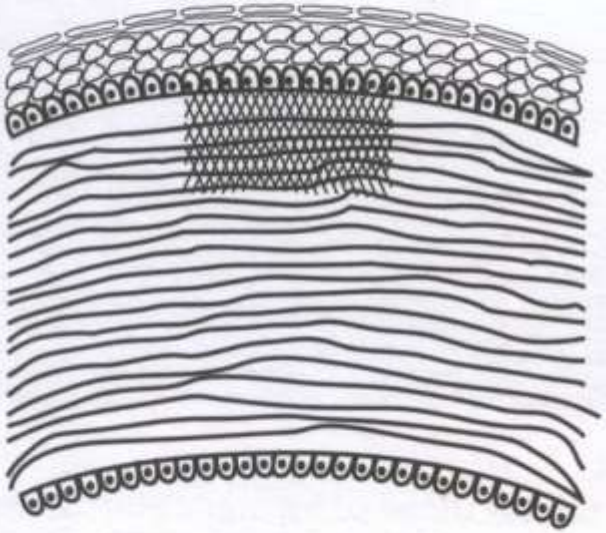
Stage of infiltration



Stage of ulceration (progressive)
with posterior abscess



Regressive stage of corneal ulcer



Healing stage of corneal ulcer with corneal scar

Fig. 7 (7)
Pathological stages of corneal ulcer.

CLINICAL PICTURE

Symptoms

Pain Severe (FB or pricking sensation)

Irritation of nerve endings

Photophobia-due to glare

Iritis - relieved by cyclopleg

Lacrimation

Blepharospasm

exposed corneal nerv

relieved by anaesthetization

Diminution of vision

Signs

Lids: Oedema

Conj.: Ciliary injection

Cornea: Loss of lustre, Grey infiltration, Oedema &positive Fluorestein staining

Iris: Tender CB, Const. pupil & Aqueous flare

COMPLICATIONS OF CORNEAL ULCERS

A) Non Perforated corneal ulcer

secondary Iridocyclitis : (Toxins)

Descematocele or keratocoele- Small translucent bleb

Keratectasia : (weak corneal scar & IOP)

staphyloma

Pseudoptregium

- ant capsular cataract
- Corneal fistula
- subluxation or ant dislocation of lens
- Purulent uveitis (endophthalmitis,
- panophthalmitis)
- Intraocular haemorrhage

COMPLICATIONS OF CORNEAL ULCERS(contd)

secondary Glaucoma - inflammatory glaucoma)

Corneal opacity (Nebula, Macula or Leucoma non adherent)

Corneal Facet : rapid healing of the epith.

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Management of corneal ulcer

- H/o
- General physical exam
- Ocular exam
- Regurgitation test ,syringing
- Exam of ulcer
- Staining with 2% fluorescein dye
- Other ocular structure

Lab investigations

- Haemogram,urine,b/d sugar
- Microbiological exam of ulcer scrapping for

a. Gram and giemsa stain
b. KOH for fungal
c. Calcoflour white stain for fungal filaments
d. sabourad medium for fungi culture
e. b/d agar for aerobic organisms

Treatment

- Specific for the cause
- Non specific supportive therapy
- Physical and general measures

Specific for the cause

- Topical drops
- Ointment at night
- Subconjunctival inj
- Systemic antibiotic
- Non specific t/t
- Cycloplegic

a. C B spasm is relieved
b. Vasodilatation so more antibodies in aqueous

- NSAID- relieve pain and oedema
- Vit C ,A, B complex

- General measures
- Hot fomentation
- Dark shade or goggle -to protect from light
- Rest , diet ,fresh air
- **T/t of non healing corneal ulcer**

a. Removal of local cause
b. Systemic cause
c. Peritomy
d. Mech debridement

- T/t of impending perforation
- Avoid strain
- Bandaging/bandage contact lens
- Reduce IOP
- Tissue adhesive –cyanoacrylate glue
- Conj flap
- P K

T/t of perforated corneal ulcer

- Small perforation in pupillary area- bandage ,rest, atropine, antibiotics
- cyanoacrylate glue followed by bandage C L or conj flap repositioning.
- TPK
- DCR/DCT if indicated
- Secondary glaucoma M/n by IV mannitol/Diamox/topical antiglaucoma drugs

Hypopyon corneal ulcer

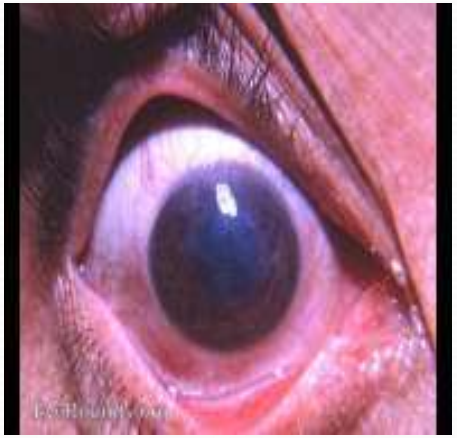
- Iritis leading to leakage of leucocytes in AC- Hypopyon
- Sterile so no **intervention**
- Shifting type since fluid
- Appear and disappear in hours
- Comn in immunocompromised,alcoholics ,debilitated and old pts

Ulcer serpens

- Hypopyon corneal ulcer due to pneumococcus
- Creeps in serpinginous fashion
- Central disc like grey yellow area with opacity more marked at edges than at centre
- Heals in one area with cicatrisation, spreads in other direction
- Violent iritis
- Hypopyon may become fibrinous


EyeRounds.org


EyeRounds.org



Fungal corneal ulcer (fungal or mycotic keratitis)

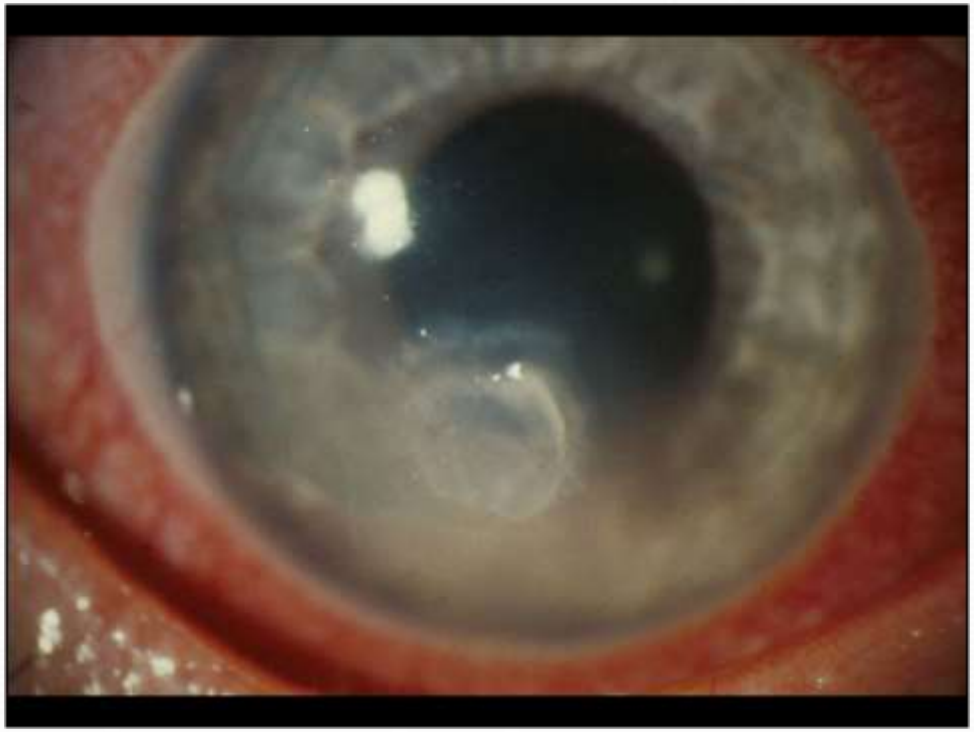
- Rural areas due to vegetative injury by thorn ,wood stick
- ocular surface changes
- Injury by animal tail
- Injudicious use of steroids and antibiotic
- immunocompromised

Clinical features

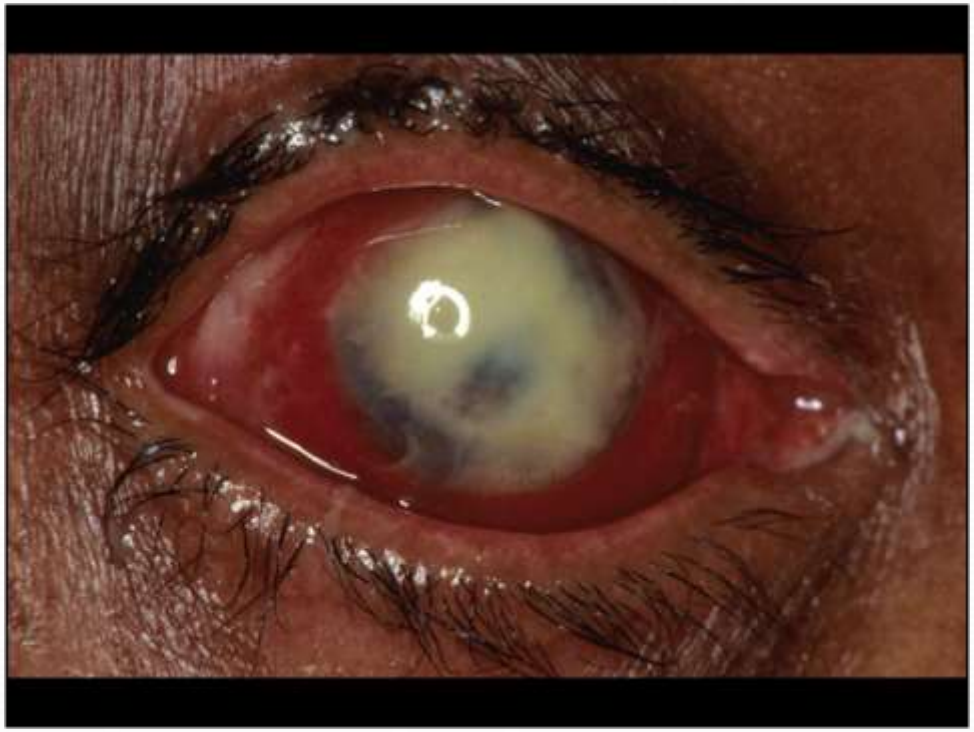
- Milder s/s
- Thick and immobile hypopyon due to invasion of fungi in AC
- Dry slough with feathery borders ,finger like ext in stroma with intact epithelium
- Vascularisation is absent
- Immune ring of Wesseley
- Satellite lesion

Severe aspergillus infection with large area of corneal ulceration and deep stromal involvement

feathery” edge to stromal involvement is suggestive of fungal infection



Severe aspergillus keratitis



Causative org

- **filamentous fungi**-Aspergillus, fusarium,cephalosporium, curvularia, penicillium

- **Yeasts**-candida albicans and cryptococcus,

Diagnosis

- Clinical feature ,history
- Gram and giemsa stain,
- Wet KOH mount
- Sabourads agar medium for culture

T/t of fungal corneal ulcer

- Natamycin ,amphotericin drops for aspergillus and Nystatin for candida
- Oint miconazole or fluconazole
- Oral antifungal if endoph seen in USG
- Vitreous tap , intravitreal inj of antibiotic and amphotericin
- TPK

Viral keratitis

HERPES SIMPLEX KERATITIS-(HSV-I ,HSV-II)

Primary or recurrent infection (Epitheliotropic)

Primary infection in early childhood

Dormant in 5th Ganglion

Recurrence with decreased body resistance

Predisposing factors

Fevers (Influenza, Common cold and Pneumonia)

Menstruation

Drugs (Immunosuppressive drugs or Steroids)

Blepharitis

Conjunctivitis

Keratitis

a. Epithelial(dendritic and geographic)

b. Stromal(necrotizing and non-necrotizing)

c. endothelitis

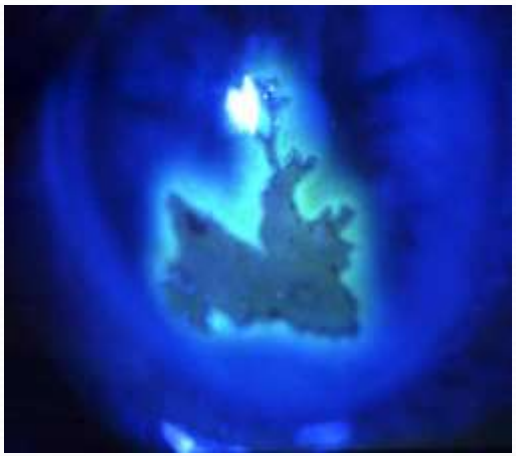
iridocyclitis

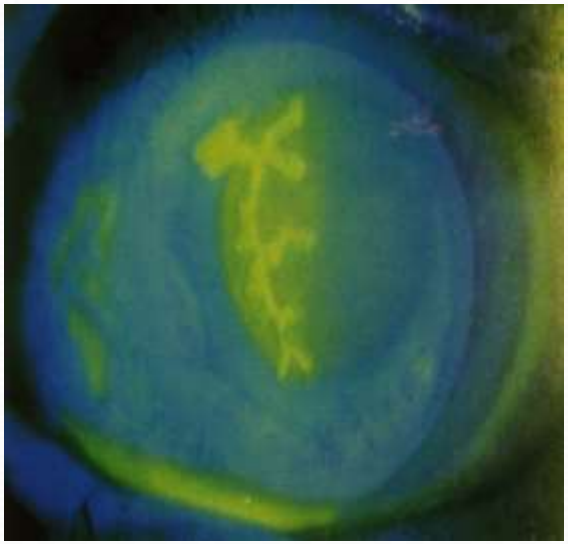
Herpes simplex epithelial keratitis

Dendritic ulcer with terminal bulbs characteristic of herpes simplex.

floor of ulcer Stains with fluorescein while margin loaded with virus laden dead cells stains with rose bengal.

May become geographic ulcer





T/t

topical antiviral ,antibiotic and lubricants with cycloplegic

Aciclovir oint 3% five times daily

Trifluridine 1% drop 4 times

IDU drops 5 times a day

Vidarabine oint 5 times

Debridement along with symptomatic therapy

- NO STEROIDS
- NO STEROIDS
- NO STEROIDS

IN PRESENCE OF ACTIVE ULCERATION

Stromal keratitis

Non necrotizing or disciform keratitis

- delayed hypersensitivity to allergen
- Diminished sensation and K P s are diagnostic other than focal disc shaped stomal oedema

Necrotising stromal keratitis

- with or without epithelial ulcer
- Direct destruction by virus causing necrosis
- Chessy white infiltration

- Treatment –same for both

Herpes simplex stromal keratitis

- Epithelial and stromal oedema
- Diminished corneal sensation
- Central folds in descemets memb
- Small K Ps
- May or may not be asso with epithelial lesions
- s/t Wessleys ring

Treatment

- Topical steroids under antiviral cover
- complications

Herpes zoster ophthalmicus

- Varicella zoster virus –DNA virus
- Chicken pox infection in childhood
- Hutchinsons rule -Frontal nerve cmn than nasociliary or lacrimal branch

- Unilateral lesions-vesicular, pustular, crust ,scar.
- Ocular lesions

Ocular lesions

- Conjunctival lesions-mucopurulent,follicular or membranous conjunctivitis with regional lymphadenopathy,
- Petechial hges
- Scleritis,episcleritis
- Zoster keratitis – 40% of pts

Keratitis

- Fine or coarse punctate epithelial keratitis
- Dendrites-mostly peripheral and stellate
- Nummular keratitis-multiple tiny granular deposits along with halo of stromal haze
- Disciform keratitis
- Neuroparalytic ulceration as a result of gasserian ganglion destruction
- Exposure keratitis due to asso fascial nerve palsy
- Iridocyclitis,ant segment necrosis due to vasculitis and ischemia,sec glaucoma.

Treatment

- Analgesics
- Systemic acyclovir-
- Reduces viral load,prevents post herpetic neuralgia if started early
- Topical antibiotic and steroid oint for cutaneous lesions
- Systemic steroids only when nerve palsies are asso and optic neuritis is present
- Antiallergic
- Antidepressant s/t if acute depression

Acanthamoeba keratitis

- C L wearers
- Vegetative trauma ,salt water diving ,hot tub use
- Symptoms
- Signs-evolves over several months with peroidic temporary remissions
- Coarse opaque streaks epi and sub epithelial opacities
- Central or paracentral ring opacity with stromal infiltration,epithelial defect
- Radial keratoneuritis

Diagnosis

- Strong clinical suspicion
- Lab diagnosis
- KOH mount for cysts
- Calcofur white stain-cysts seen as apple green under fluorescene microscope
- Culture on non nutrient agar enriched with E Coli

T/t

- Non speccific
- Specific
- 1% propamidine istheionate drops
- Imidazole derivatives
- Neomycin drops
- Polyhexamethylene biguanide .01% drops

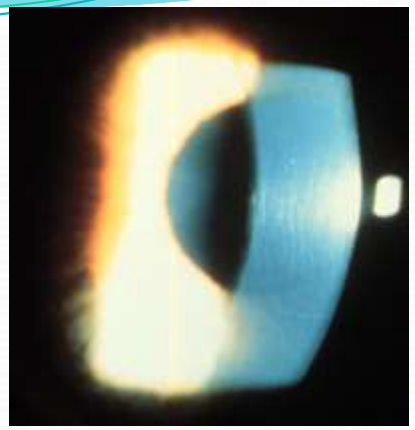
Keratoconus

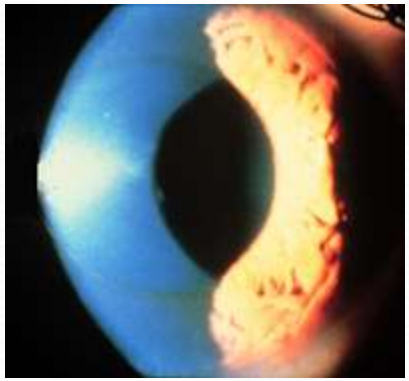
- Non inflammatory ectasia of cornea mostly inferotemporal
- Congenital weakness
- Trauma
- Vernal keratoconjunctivitis
- Downs syndrome

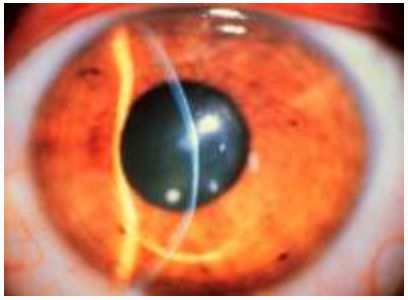
Signs

- Munsons sign
- Oil droplet appearance
- Vogts striae
- Fleichers ring
- Acute hydrops
- Placcidos disc
- Keratometry

- Pachymetry

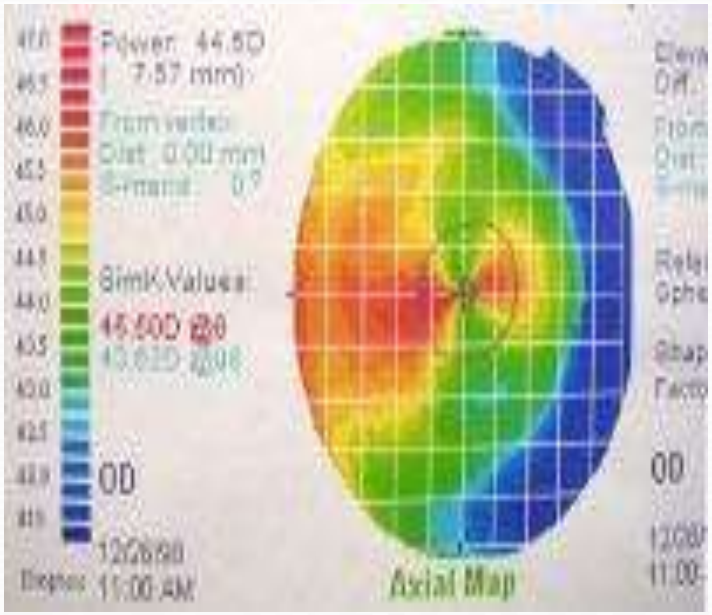


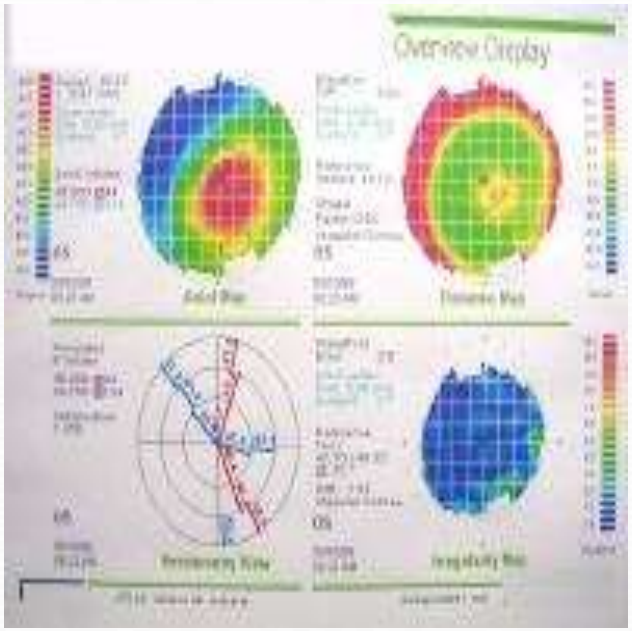




high central corneal power, large difference between the power of the corneal apex and of the periphery, and disparity between the 2 corneas of a given patient.

Topography





t/t

- Spectacles
- RGP
- Collagen cross linking
- P K ,DALK

keratoplasty

- Indications

1. Optical

1. Theraputic

1. Tectonic

1. Cosmetic

- Short term storage
- Intermediate term storage
- Long term storage

- Method –lamellar –ant or post
  Full thickness
- size ,sutures
- Complications
- Early
- Late

- https://www.willseye.org/treatment/full-thickness-corneal-transplantationstandard-penetrating-keratoplasty-pk/
- P K video