Diseases of Cornea

Dr. Sanjay Kai, MD(AIIMS) Professor Dept. of Ophthalmology, GMC Jammu

Anatomy

- Cornea forms 1/6th of anterior eye
- Elliptical with horiz dia 11.7mm, vertical 10.6mm
- Central thickness 0.5mm to 0.6mm and peripheral 1.2mm
- Radii of curvature anterior is 7.8mmand post is 6.5mm



- Refractive index is 1.376
- Five layers .Epithelium, Bowmans, stroma dua's layer and endothelium
- Epithelium is lipophilic and stroma is hydrophilic



- Nerve supply- Ophthalmic div of trigeminal nv. As long ciliary nv travel in perichoroidal space ,exit limbus and form subepithelial and intraepithelial plexus.
- Transparency-
- 1. Lack of blood vs
- 2. Endothelial pump
- 3. Tight epithelial and endothelial jn
- 4. Uniform ref index.lamellar distance less than wavelength so destructive interference

Supf keratitis- if infl is superior to bowmans.if discrete k.a SPK

- Deep keratitis- infl in stroma . It could be interstitial or endothelitis
- Epithelial defect- if without infl k.a erosion/abrasion
- If there is intense infl with lymphocytes k.a infilterates
- Inflamation lead to scar/opacity





Superficial punctate keratitis





Epithelial defect/ abrasion

Deep keratitis

Corneal opacity

- 1. Nebular- mild haze, iris details seen
- Macular- Details not seen. 2/3 stroma involved
- 3. Leucomatous full thickness opacity
- 4. Adherent leucoma, Corneoiridic scar, staphyloma





Macular opacity

Leucomatous opacity





Striate keratopathy

Bullous keratopathy





Keratic precipitates

Corneal ulcer, Hypopyon

- Corneal edema- Any insult in form of infl or increased IOP
- 1. Epithelial haze
- 2. Stromal haze
- 3. Bullous keratopathy
- 4. Striate keratopathy.

- Keratic precipitates- lymphocytes on endothelium. Sign of inflamation
- Hypopyon collection of leucocytes plus fibrin in A/C. Mobile in bacterial and fixed in fungal keratitis
- It can be sterile in severe uveitis.

Bacterial corneal ulcer

- Mostly exogenous bacteria like pseudomonas, staphylococus, pneumococus, gonococci, E. coli
- Gonococci , diptheria and N menigitidis can invade intact cornea
- Normal cornea protected by tear lysozyme, lactoferin and washing effect of tears

Risk factors

- Trauma
- Prolong steroid therapy
- Dry eyes
- Entropion with trichiasis
- Lagophthalmos (Facial nv palsy)
- Contact lenses
- PBK and ABK
- Poor hygiene and dacryocystitis.

Stage of progressive infilteration- microbial invasion cause infilteration of areaby PMN

Stage of active ulceration- active necrosis of epithelium, bowman and stroma leading to ulcer. Walls of ulcer swells due to fluid and PMN. Zone of infilt increases and floor shows grey infilt and sloughing. Circumciliary congestion with purulent exudates on cornea. Iridocyclitis with hypopyon may be seen. Ulcer may progress lateraly or deep and lead to descematocele or perforation.

Stage of regression – due to treatment and immunity there is formation of demarcation line by leucocytes with phagocytosis. Vascularisation with epithelisation begans **Stage of cicatrisation-** laying of fibroblast and fibres underneath epithelium. Resultant opacity may be nebular, macular or leucomatous.

Pathophysiology(Bacterial)



- Stage of progressive infiltration
- · Lymphocytes infiltrates in epithelium
- Necrosis

Stage of active ulceration

- Greyish infiltration with circumcorneal hyperaemia
- Hypopyon and descemetocele



Stage of regression

- Phagocytosis
- Ulcers begin to heal



Stage of cicatrization

- Epithelium covers the ulcers
- · Scars and opacities formation

Pathology of perforated corneal ulcer

Deep ulceration

Descemetocele

Perforation

Adherent leucoma





Perforated ulcer

Adherent leucoma

Pathology of sloughed ulcer and anterior staphyloma

Sloughing except thin peripheral rim

Pseudocornea

Ectatic cicatrix /staphyloma

Clinical features:

- Depends of virulence of organism and host response. May manifest as.
- 1. Purulent ulcer without hypopyon
- 2. Hypopyon corneal ulcer.

Symptoms

- a. Pain, FB sensation
- b. Watering, redness circumcilliary
- c. Photophobia and blurred vision

Signs :

- a. Swollen lids with blepharospasm
- b. Chemosis and conjunctival hyperemia
- c. Ulcer to begin seen as defect with infilteraes which enlarges with stromal edema, overhanging margins and floor is covered with yellowish white exudates.

Characterstics of certain bacterial ulcers

- Staph aureus and strept pneumonae oval yellowish white opaque ulcer with relatively clear surrounding cornea
- Pseudomonas- irregular with thick greenish mucopurulent exudate. May perforate in 48 to 72hrs
- Enterobacteriae(E. coli, proteus, klebsiela)shallow with grey white suppuration, stomal haze, endotoxin may produce ring infilterate

Clinical presentation



Staphlococcus



Pseudomonas



Pneumococcus



Enterobacteriaceae

- The anterior chamber may or may not have hypopyon. sterile till descemet is intact.
- Iritis with small pupil and muddy iris
- IOP may be raised

- Hypopyon corneal ulcer- reserved for ulcer caused by pneumococus, others are called as ulcer with hpopyon.
- Source chronic dacryocystitis. More common in old and debilitated persons
- Grey white or yellowish near centre tendency to creep over cornea so k.a ulcus serpens.
- Violent iridocyclitis and hpopyon, sec glaucoma
- Spreads rapidly with tendency to perforation.

Complications of corneal ulcers

- Toxic iridocyclitis
- Secondary glaucoma
- Descematocele
- Perforated corneal ulcer
- a. Iris prolapse
- b. Subluxation /ant dislocation of lens
- c. Ant capsular cataract
- d. Corneal fistula
- e. Endophthalmitis and introcular haemorrhage.

- Corneal scarring
- a. Opacity- nebular, macular, leucomatous
- b. Adherent leucoma
- c. Ectatic cicatrix or kerectasia
- d. Anterior staphyloma

Management

- Diffuse light exam for lid abnr and sensations
- Regurgitation and syringing
- Slit lamp exam after staining for size, shape, depth, margin, floor and vascularisation
- A/C exam for KPs, hypopyon, iris and lens exam

Corneal scraping

- Topical anesthesia
- Eye speculum
- Under slit lamp/ op microscope
- Kimura's spatula/ 26 G' needle/ BP blade
- Scraped from base and leading margin of the ulcer by short firm strokes



Staining

Bacterial and fungal

- Gram's stain
- KOH mount
- Giemsa stain

Acanthamoeba

- Calcofluor white
- HE stain
- Immunofluorescent stain

GRADING

CHARACT	MILD	MODERATE	SEVERE
ERISTIC			
SIZE	<2mm	2-5 mm	>5mm
DEPTH	<20%	20-50 %	>50 %
INFILTRATE	SUPERFICIAL	MID	DEEPER
SCLERA	NOT	STROMAL	MAY BE
	INVOLVED	NOT	
		INVOLVED	INVOLVED

Gram's stain

Procedure

- Dry Heat / methylalcohol fix
- Crystal Gentian violet staining for 1 min
- Rinse slide with water
- Gram's iodine for 1 min
- Again rinse slide with water
- Decolorise slide with acetone / acid alcohol for 20s
- After rinsing with water counter stain with safranin for 1 min
- Slide finally rinsed with water and air dried

Gram-stained smear

- G +ve cocci
 - Staphylococcus sp
 - Streptococcus sp
- G +ve rods
 - Bacillus sp
 - Corynebacterium sp







Gram-stained smear

G –ve cocci

- Neisseria sp
- Hemophillus sp
- G –ve diplo bacilli
 - Moraxella sp





Gram-stained smear

• G –ve rods

- Pseudomonas sp
- Klebsiella sp
- Proteus sp
- Escherichia sp
- Serratia sp
- Enterobactor sp
- Citrobactor sp



Giemsa staining

- Stains used are eosin methyline blue and azure red
- This stains
 - High light DNA
 - Cytoplasmic RNA in lymphocytes
- Giemsa stain identifies normal and inflammatory cells
- Bacteria and fungal hyphae \rightarrow blue
- Pseudo hyphae \rightarrow dark blue

Culture media used

Routine

- Blood agar plate
 - Aerobic and facultatively anaerobic bacteria, fungi
- Chocolate agar plate
 - Aerobic and facultatively anaerobic bacteria; enhances the isolation of Moraxella, Neisseria, Haemophilus
- Sabouraud dextrose agar plate

– Fungi

- Supplemented thioglycolate brothe
 - Aeroic and anaerobic bacteria

Bacterial Infective keratitis Treatment

- Fortified tobramycin 14 mg/ml add 2 ml of parenteral tobramycin (40 mg/cc) to 5 ml commercial 0.3% tobramycin solution. Refrigerate (expires in 7 d)
- Fortified cefazolin 50 mg/ml –dilute
 500 mg parenteral cefazolin powder in sterile water to form 10 ml solution. Refrigerate (preparation expires in 7 d).

Bacterial Infective keratitis Treatment

 Monotherapy can be used in mild to moderate ulcer if senstive to broad spectrum antibiotics like ciprofloxacin 0.3%, Gatifloxacin 0.3%, Moxafloxacin 0.3%.

Non specific treatment

- a. Cycloplegics like 1% Atropine, 2% Homatropine,.
- b. Systemic analgesics
- c. Vitamin A, B-complex, Vitamin C and good nutrition. Dark goggles for photophobia

Treatment of Non Healing Ulcer

- Remove cause
- Local causes
- ► Raised IOP
- ➢ Trichiasis
- **FB**, Dacryocystitis
- >Non compliance
- ➤ Lagophthalmos
- Sytemic causes

D mellitus, Anaemia, malnutrition and steroids

Treatment of Non Healing Ulcer

- 2. Mechanical debridement
- Cauterisation with pure carbolic acid or 10-20% TCA
- 4. Bandage contact lenses
- 5. Peritomy

- Treatment of impending perforation
- > Avoid strain
- Pressure bandage
- Lowering of IOP
- ➢ Tissue adhesive glue. Fibrin/cyanoacrylate
- Conjunctival flap
- ➢ BCL
- Tectonic PK/ Tectonic patch graft

Treatment of perforated ulcer

- Tissue adhesive glues
- Conjunctival flap
- BCL
- Therapeutic keratoplasty.

Marginal catarrhal ulcer

Caused by hypersenstivity to staph toxins.
 Moraxella and haemophilus can also cause.

Symptoms

- Pain, irritation, photophobia and watering.
- Signs
- Blepharoconjunctivitis
- Shallow ulcer assoc with vascularisation.
- ➢ Heals , Recurrences.

Treatment

- Short course of antibiotics and steroid
- Lid hygiene with treatment of blepharitis.

FUNGAL KERATITIS

- MOST DIFFICULT TO DIAG. , TREAT.
- EPIDEMIOLOGY INCIDENCE- 6- 30 % MOST ISOLATES-ASPERGILLUS(≈50%) FUSARIUM (≈20%) PENICILLIUM (≈15%)

(CONTD....)



(CONTD....)

<u>RISK FACTORS</u>

TRAUMA- VEG. FB PROLONGED TOP. CS. POST PK - SUTURE - CS/ ABs - PED CHRONIC KERATITIS - VIRAL - ALLERGIC DIABETES MELLITUS

CLINICAL FEATURES

 SLOW ONSET PAIN, PHOTOPHOBIA, REDNESS, ↓ VA. <u>NON – SPECIFIC</u> <u>SPECIFIC SIGNS</u> EPITH. DEFECT INFILTRATE CONJ. INJECTION ELEVATED EDGE AC REACTION FEATHERY MARGINS FIED HOPPON DRY/ROUGH TEXTURE

GREY/ BROWN PIGMENT.





FUNGAL KERATITIS

Diagnosis

- Typical history and signs, symptoms.
- Wet KOH mount,

Staining

Fungal

- Gram's stain
- KOH mount
- Giemsa stain



Antifungal drugs

- **Polyenes**: Natamycin, nystatin, amphotericin B.
- Azoles:
 - Imidazoles: *ketoconazole, miconazole, econazole, and clotrimazole.*
 - Triazoles : *fluconazole*, *itraconazole*, *saperconazole*.
- Eluorinated pyrimidines: flucytosine.

 FOR CLARIFICATIONS CONTACT DR. SANJAY KAI ON 1ST DEC. IN SEMINAR ROOM OF EYE DEPTT BETWEEN 1 TO 2 PM.