Infectious keratitis

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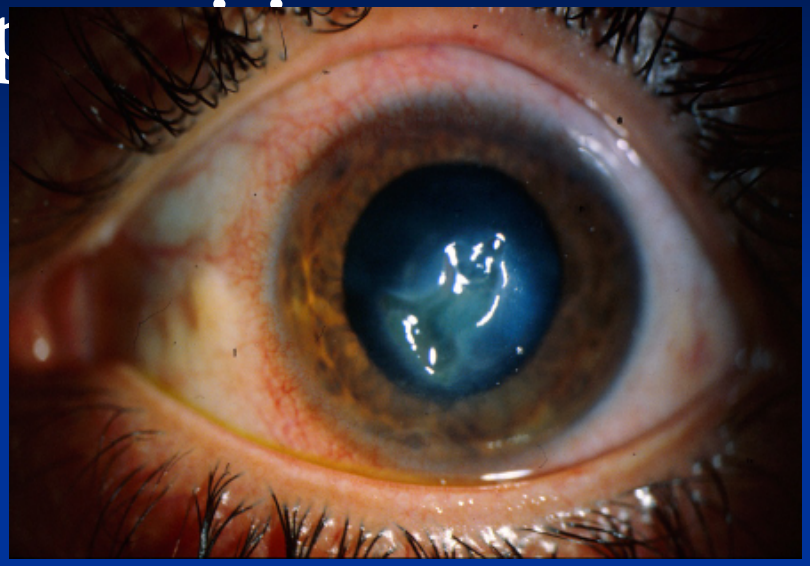
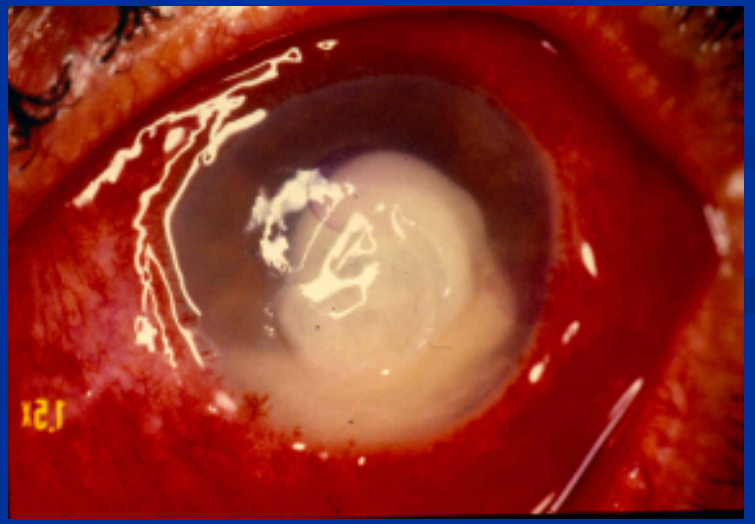
- Infectious corneal ulcers can be caused by viruses, bacteria, fungi or





Bacterial Keratitis

- A central corneal infection is a true ocular emergency
- Destruction of corneal tissue can take place within 24 hrs.
- A central corneal ulcer has a worse prognosis
- Whenever a corneal infection is suspected immediate laboratory studies and therapy should be instituted.
- Frequent and careful F/U and adjustment of therapy are necessary to ensure the best outcome.

Pathogenesis

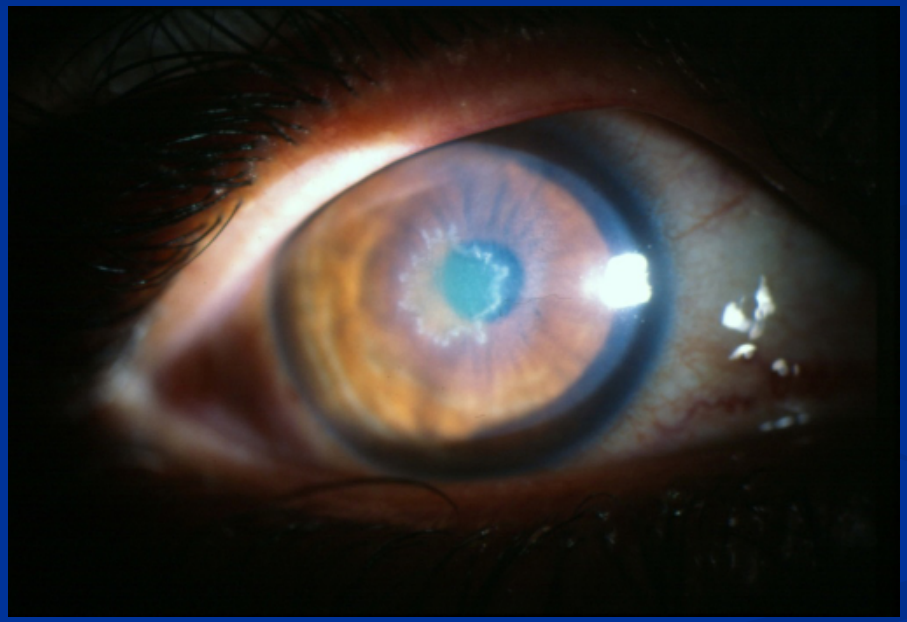
Defens mechanisms of cornea

A. Lids
B. Mechanical flushing action of the tears
C. Chemical action of tear lysosome, lactoferrin, betalysin, IgA…
D. Mucus traps and remove organisms
E. Intact epithelium
F. Glycocalyx and mucin layers inhibit microbial attachment
G. Normal flora of ocular surface inhibits overgrowth of pathogens.
H. The eye's acute nonspecific inflammatory reaction to injury by invading neutrophils

- Interference with any defense mechanisms leads to corneal infection
  - Lids abnormality: trichiasis, enteropion
  - Dry eye
  - Abuse of antibiotics
  - ABK / PBK
  - Corneal anesthesia
  - Corneal trauma
  - Medica mentosa → E.D
  - CL → soft lens
  - Topical steroid → ICK
  - Compromized host → Immunosuppressive, old age, infancy…

- It is important to diagnose underlying conditions that may have led to the infection and correct them if possible.

- Most bacterial keratitis develop at the site of an epithelial abnormality or defect on the corneal surface.

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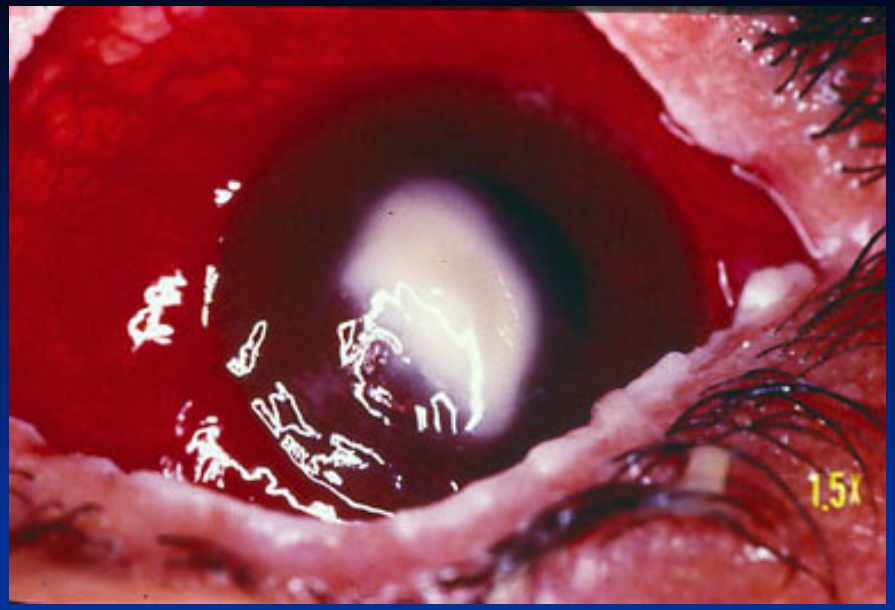
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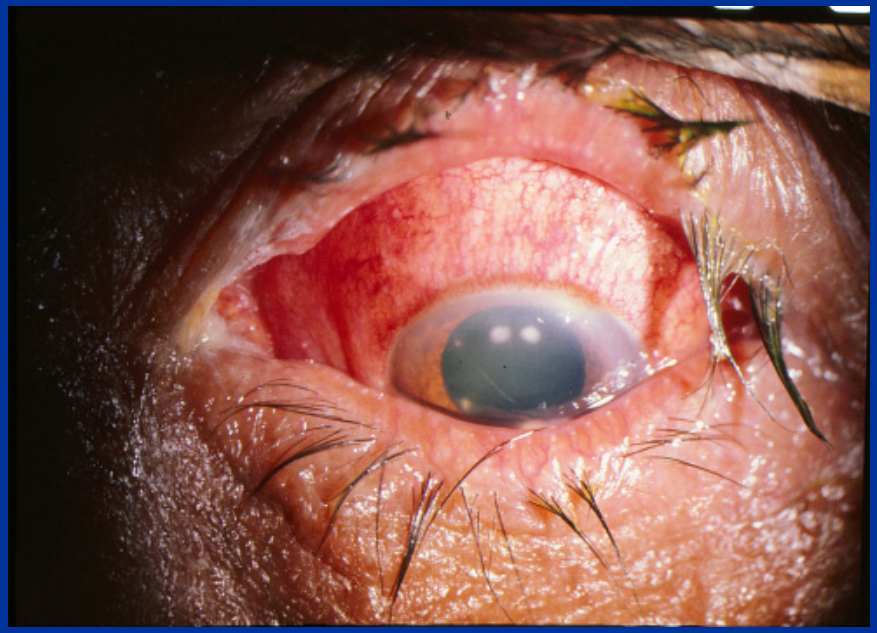
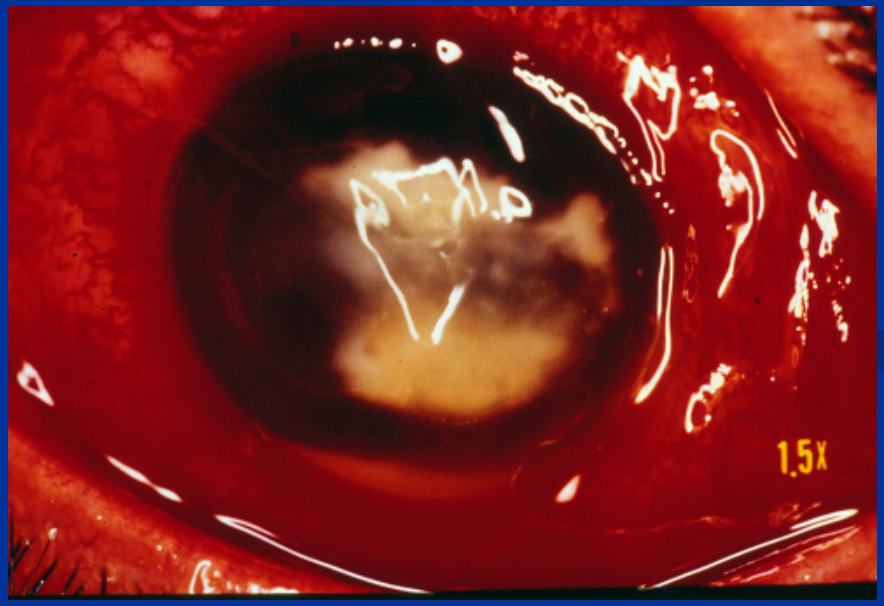


- In compromised eyes or patients, organisms normally present in the tear film can produce infection, but pathogenic bacteria can be introduced by FB's…
- Bacterial agents in compromised corneas:
- Staph aureus
- Staph epidermidis
- α and β hemolytic strep
- Pseudomonas aeruginosa

- In contact lens wearers:
  - Pseudomonas A
  - Staph A and E
- Under 3 years of age pseudomonas aeruginosa and streptococcal species account majority of infections
- Three groups of patients have an increased risk of CL related infectious keratitis:
  - Aphakes, Corneal transplant and those with chronic keratopathy

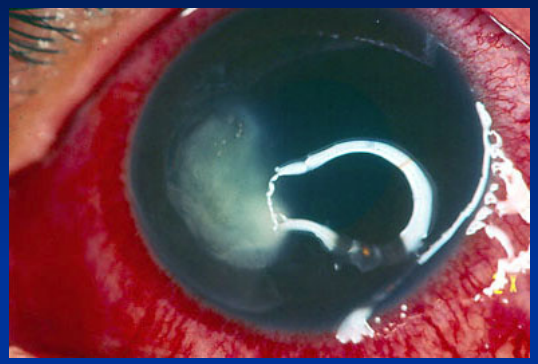
- Clinical manifestations:
  - Conjunctival injection
  - Conjunctival chemosis
  - Lid edema
  - Pain/tearing/photophobia/purulent discharge
  - Infiltration and edema of the stroma
  - Stromal abscesses
  - AC reaction/Fibrin plaques on the endothelium
  - Hypopyon

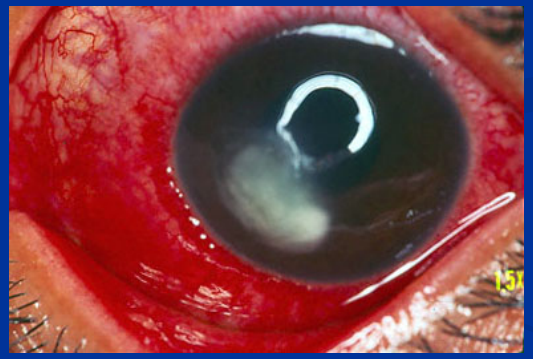


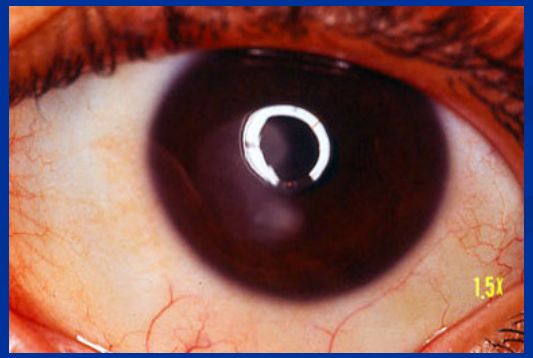
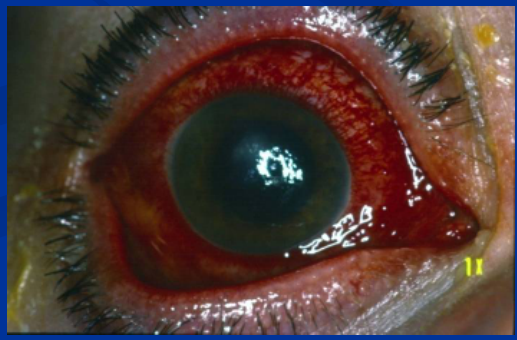
- Usually the hypopyon is sterile as long as Descemet's membrane is intact.
- Causes of hypopyon
  - Bacterial
  - Viral
  - Fungal
  - Behcet's synd.
  - Topical anesthetics
  - Alkali burns

Pathogenesis

- Progressive stage
- Regressive stage
- Healing stage





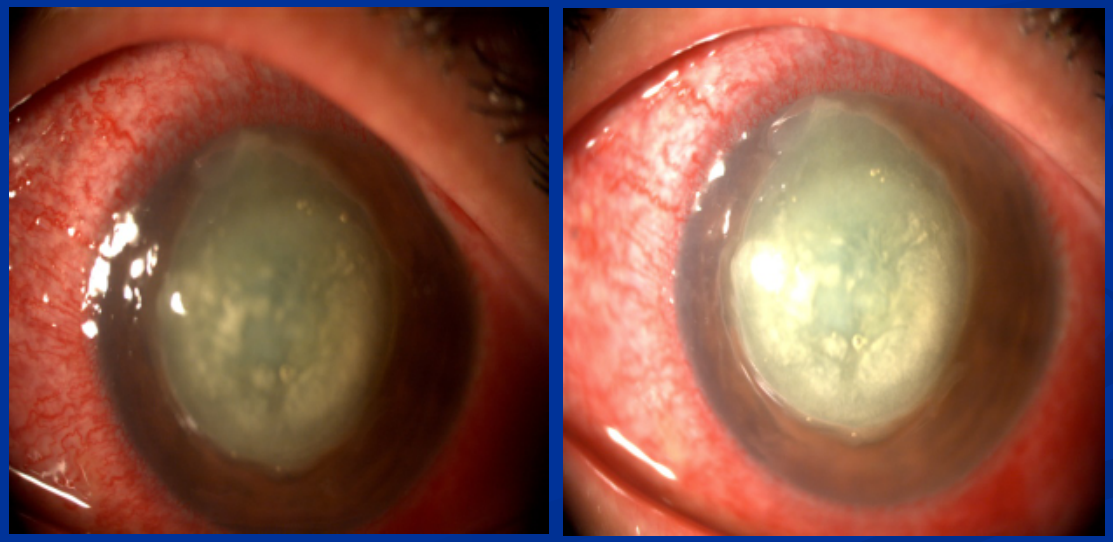



- Differential diagnosis:
- It is important to quickly recognize and treat bacterial corneal infections
  - Herpes simplex ulceration
  - Fungal keratits
  - Parasitic keratitis
  - Trophic ulceration
  - Toxic keratopathy
  - Ulcerative keratitis
  - Noninfectious stromal infiltration (CL)
  - Systemic collagen vascular disorders

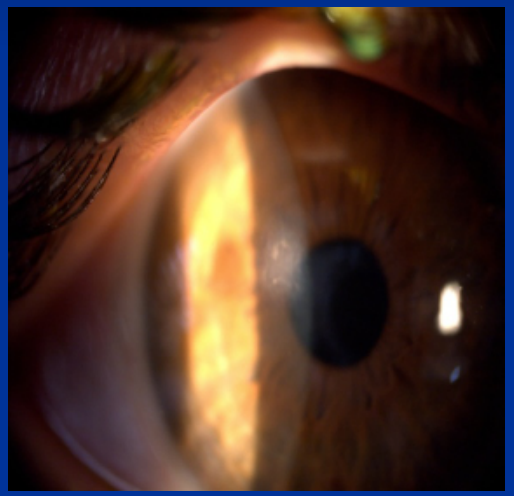
Clinical approach

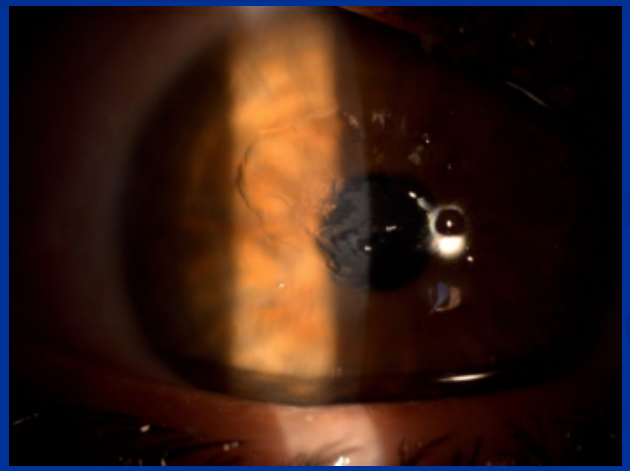
- Adequate scraping of the ulcer
- Gram and Giemsa staining
- Culture: blood agar, chocolate agar

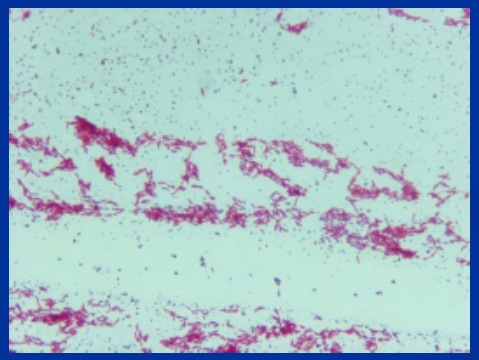
POD = 5

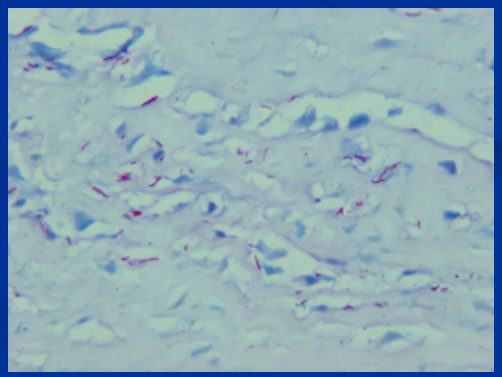


- Corneal biopsy may be indicated in a partially treated or unresponsive corneal ulcer.
- The biopsy specimen should be at least 1-2 mm in diameter.
- Debulking or debridment of necrotic tissue.
- IC Herpes/Acanthameoba

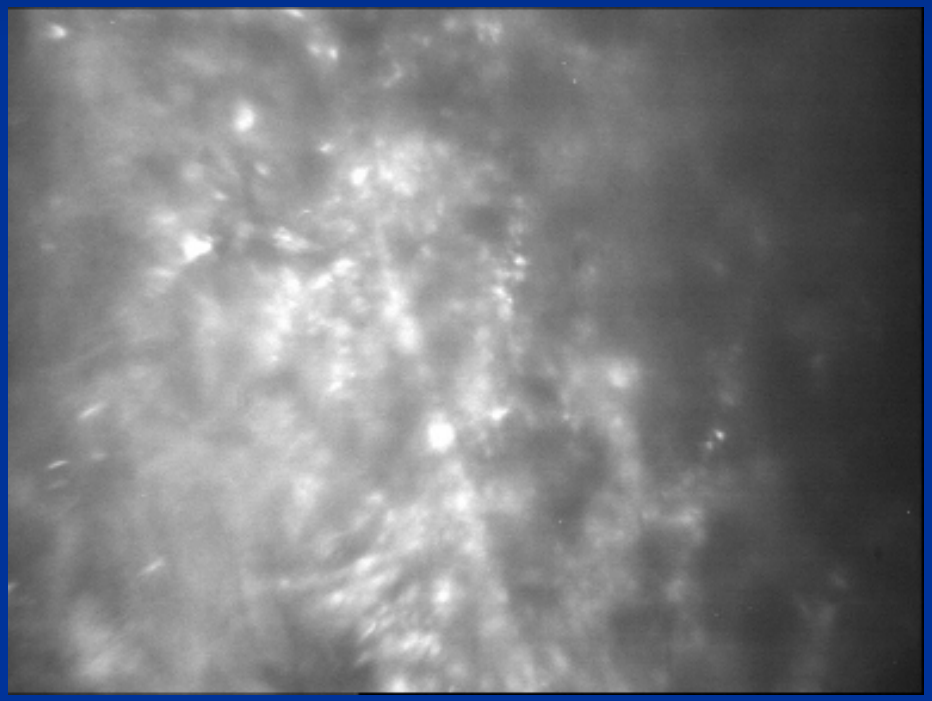


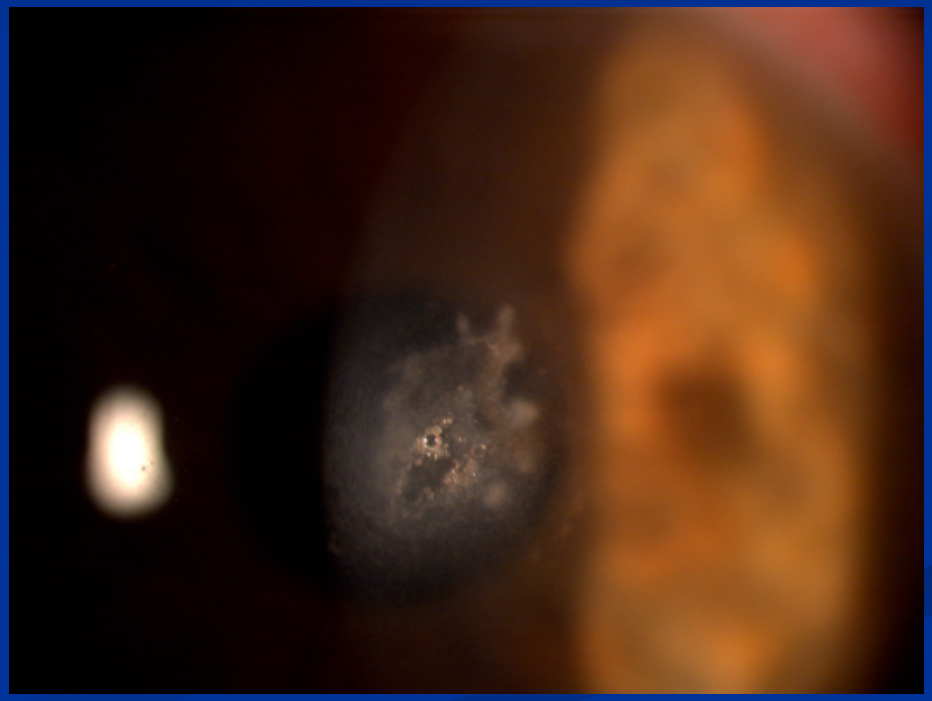






- Confocal microscopy





Treatment

- Initial treatment is based on the interpretation of the corneal smears, but most corneal surgeons prefer to use combined broad spectrum therapy in most cases.
- Polymicrobial keratitis is encountered in 6 to 58% of cases overall
- Combination therapy is effective against approximately 95% of all ocular bacterial isolates.

- Broad specturm coverage is best obtained with an aminoglycoside and a cephalosporine (Cefazolin+Gentamycin or Tobramycin)

- Tobramycin is 2-4 times more active than gentamycin and less nephrotoxic.

- Fortified Gentamycin or Tobramycin (13.5 mg/ml) to cover gram negative bacteria in combination with Cefazolin (Kefzol) fortified at 50 mg /ml to cover gram positive organisms.

Table 81.4 Antibiotic therapy of bacterial keratitis
(Adapted from Basic Clinical and Science Course 2000–2001, Section 8; External Disease and Cornea. Table VIII-8. American Academy of Ophthalmology.)

Organism	Antibiotic	Topical concentration	Subconjunctival dose
No organism identified or multiple types of organisms	Cefazolin with Tobramycin/gentamicin or Fluoroquinolones	50 mg/ml 9–14 mg/ml 3 mg/ml	100 mg in 0.5 ml 20 mg in 0.5 ml
Gram-positive cocci	Cefazolin Vancomycin*	50 mg/ml 15–50 mg/ml	100 mg in 0.5 ml 25 mg in 0.5 ml
Gram-negative rods	Tobramycin/gentamicin Ceftazidime Fluoroquinolones	9–14 mg/ml 50 mg/ml 3 mg/ml	20 mg in 0.5 ml 100 mg in 0.5 ml
Gram-negative cocci†	Ceftriaxone Ceftazidime Fluoroquinolones	50 mg/ml 50 mg/ml 3 mg/ml	100 mg in 0.5 ml 100 mg in 0.5 ml
Nontuberculous *mycobacteria*	Amikacin Clarithromycin‡	20–40 mg/ml	20 mg in 0.5 ml
Nocardia	Amikacin Trimethoprim/sulfamethoxazole: Trimethoprim Sulfamethoxazole	20–40 mg/ml 16 mg/ml 80 mg/ml	20 mg in 0.5 ml

**For resistant* Enterococcus *and* Staphylococcus *species and penicillin allergy.*
†Systemic therapy is necessary for suspected gonococcal infection.
‡Dosage for oral systemic therapy in adults is 500 mg every 12 hours. Topical therapy has had some success but the medication is irritating and clinical experience is limited.

Routes of admistration

- Topical
  - Two antibiotics should not be mixed together in the same container
  - The antibiotic should be replaced every 3-5 days.
  - Frequency: every 30 minutes is sufficient
  - 15 minutes?
- Subconjunctival injection?
  - In animal model subconjunctival injections do not provide additional effect when fortified antibiotics are admistered.
  - In children
  - In uncooperative patients
- Systemic antibiotics
  - Corneal perforation
  - Scleral involvement
  - (CAM)

Ancillary Techniques in Management of Microbial Keratitis

- Oral tetracycline

Topical Corticosteroids

- The potential benefits of corticosteroids in reducing corneal scarring and improved patient comfort in bacterial keratitis need to be balanced against excessive suppression of the immune response and resultant potentiation of infection.

Corneal Collagen Cross-Linking

- To better distinguish the use of CXL for the treatment of infectious keratitis from that used for progressive keratoconus, the term photoactivated chromophore for infectious keratitis (PACK)-CXL was created at the ninth cross-linking congress in Dublin, Ireland, in 2013.

Intrastromal Antimicrobials

- Intrastromal delivery of antifungal agents.

Amniotic Membrane Transplantation

- The AM's antibacterial, anti-inflammatory, and antifibro-blastic properties are well recognised, and may play a role in the management of microbial keratitis.

- Surgical intervention
  - Surgery may be considered if medical therapy fails to eradicate the pathogen
  - SK
  - Biopsy
  - Conjunctival flap
  - PK