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

- If they are not the most frequent type,

  **BUT:**

  - The diversity of the clinical presentations
  
  - Difficulty of treatment

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  - Delayed Dx and Rx

  - The aftermath of “Fngl Krtts” can be dismal.
Mycotic Keratitis

Prevalence

- **India:**
  - Fungal aetiology were confirmed in 1095 (34.4%) of 3183 corneal ulcers.

- **North India:**
  - 191 (39%) fungal keratitis (485 Cornea ulcer)

- **Dar es Salaam, Tanzania:**
  - 212 corneal ulcer, 32.1% Bacterial & 15.1% fungal (F. solani: 75%)
Mycotic Keratitis

Prevalence

- **Dehli, India**
  - 346 corneal ulcer, 22.25% fungal aetiology
  - A. flavus: 31.16%
  - A. fumigatus: 16.88%
  - Fusarium spp.: 7.79%
  - Yeasts: 21.62%

- **South Florida**
  - 663 corneal ulcers: 238 Bacterial, 133 fungal (20.1%) – 292 culture negative
  - Fusarium spp. *The most common*
Mycotic Keratitis

Prevalence

- Paraguay
  - 660 corneal ulcer: 79% cul +ve: 51% due to Bacteria, 26% to fungi, 23% both fungi & Bacteria
- Acremonium spp. 40%, Fusarium spp. 15%

- **Karachi, Pakistan** (fungal keratitis)
  - In a series of suspected cases of fungal keratitis, 119/128 (75% patients) had positive results for fungus in corneal scrapings by direct microscopy using Grams staining method and culture on Sabouraud dextrose agar.
Keratomycosis/ Fungal agents

• Brazil:
  • Fusarium spp.  67%,
  • Aspergillus spp.  10.5%,
  • Candida spp.  10%.
  • 40% of the infections were related to trauma.

• In the northern USA,
• yeast, Candida albicans.
Keratomycosis/Fungal agents

- **Mexico city**
- Fusarium: 37.7%
- Fusarium solani, F. dimerum, F. oxysporum

- Aspergillus: 26%
- Aspergillus fumigatus, A. nidulans, A. flavus, A. niger, and A. glaucus

- Filamentous melanized fungi: 39%

- International Journal of Inflammation. Volume 2012 (2012), Article ID 643104, 8 pages., *Support of the Laboratory in the Diagnosis of Fungal Ocular*
Keratomycosis/fungal agents

- **India:**
  - Fungal aetiology were confirmed in 1095 (34.4%) of 3183 corneal ulcers
  - Fusarium spp. 42.82%
  - Aspergillus spp 26%.
  - Ocular trauma 92.15%
  - Vegetative injuries: 61.28%
  - 15.71% patients had concurrent diabetes mellitus

- **In Madurai, India,** 139 fungal keratitis
  - 47% caused by Fusarium,
  - 17% caused by Aspergillus,
  - Trauma referred in 46.8%

Keratomycosis

- **Laboratory diagnosis**

- Once there is *clinical suspicion of a fungal infection*, every effort should be made to recover the causative fungus so that *appropriate antifungal therapy* may be instituted timely.

- The various clinical samples, for laboratory diagnosis, include:
  - (a) corneal scraping
  - (b) corneal biopsy
  - (c) anterior chamber aspirate.

Keratomycosis

- Laboratory diagnosis
- Corneal scraping

Scraping is collected after anaesthetising the cornea with 0.5% proparcaine drops and waiting for 2-3 minutes. With the help of sterile Kimura spatula or Bard-Parker blade No.15 or Iris repositor, scraping is done by applying multiple, moderately firm, unidirectional strokes, under slit lamp illumination.

Material is collected both from the base as well as from the edge of the ulcer, after retracting the lids properly and after cleaning any discharge or debris from the vicinity of the ulcer.

Collection of a mere corneal swab is not recommended.

Use of a calcium alginate swab is sometimes advised for better yield of fungus. However, its utility is still debatable.
Keratomycosis

- Laboratory diagnosis
- Corneal biopsy

- It is a relatively invasive (trephining) procedure and requires minor OT.

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- The indications of biopsy are:
  - (a) strong clinical suspicion of fungal keratitis
  - (b) at least 2 negative smear and culture reports
  - (c) no clinical improvement on empiric antibiotic therapy.
Corneal biopsy

The biopsied material is preferably removed en bloc.

*It is bisected,*

half being sent to microbiology laboratory for homogenization and culture and smear examination, and the remaining half put in 10% buffered formalin for histopathological examination.
Keratomycosis

- Laboratory diagnosis
- Anterior chamber aspirate

- Anterior chamber (AC) paracentesis is done when:

- 1- There is strong clinical suspicion of intra-ocular infection.
- 2- Progressive corneal damage and persistent hypopyon are also indicative of this procedure.

- The aspirate is collected with the help of sterile tuberculin syringe and 22 gauge needle. The AC is tapped via the limbus.
- However, the nozzle of the syringe should be sealed with a sterile rubber bung and the whole set should be transported immediately to the laboratory for processing.
Keratomycosis

• Processing of samples

• As a routine,
• the scraped out corneal tissue or the biopsied material after homogenization is divided into 3 portions, one for Gram staining, one for 10% KOH wet mount and the third for culture.

• The sensitivity of simple KOH wet mount for the presumptive diagnosis of fungal keratitis: 33 to 92%.

• Gram stain: an accuracy of 60-75% in detecting the causative organism, is undoubtedly a simple and rapid method.

• Other staining techniques like periodic acid schiff (PAS), H&E, Gomori’s methenamine silver, calcofluor white, acridine orange, fluorescent stainings have also been recommended.
KOH Sensitivity

• **India**
  - Fungal aetiology: 1095 (34.4%) of 3183 corneal ulcers
  - **The sensitivity of (KOH): 99.23%**
  - **Gram-stained smear: 88.73% (P<0.0001).**

• **Iran, Sari**
  - 22 Fungal Keratitis
  - **The sensitivity of (KOH): 71.4%**
  - **Gram-stained smear: 42.9%**

• **North India**
  - 191 (39%) fungal keratitis (485 Cornea ulcer)
  - **The sensitivity of (KOH): 62%**
Keratomycosis

- **Culture and identification**
  - The conventional culture techniques:
  - on SDA, BA, CA & BHI Broth
Keratomycosis

• Interpretation of culture report

• Fungal spores being ubiquitous,
• The causative agents of mycotic keratitis are often saprophytic,
• Therefore, in order to attribute clinical significance to a particular growth, the following criteria need to be considered:

• (1) the laboratory finding should be correlated with clinical presentation,
• (2) inoculation should be done on ‘C’ streak manner and growth occurring only on the ‘C’ streak is considered significant,
• (3) smear results should be consistent with culture,
• (4) the same fungus should grow in more than one culture medium and
• (5) the same organism should grow from repeated scrapings.
Keratomycosis

- Molecular methods for the diagnosis of mycotic keratitis

- The sensitivity of PCR, taking culture as the gold standard, was quite high between 89 to 94%, whereas, specificity ranged between 50% to 88%.
Influence of fungal species on clinical presentation, therapeutic management and outcome of infection

• Fusarium species produce very severe infection with rapid onset of perforation of the cornea. Vision may be completely lost if timely therapeutic intervention is not initiated. The same is true for Aspergillus flavus infection. Both produce toxins and extracellular enzymes like proteininases.
Influence of fungal species on clinical presentation, therapeutic management and outcome of infection

• Some studies revealed that corneal infections due to Aspergilli and Fusarium species are so severe that, around 42-60% of those may lead to malignant glaucoma. In most of the cases the features is so severe, that therapeutic keratoplasty is often indicated.

• Infection due to dematiaceous fungi (Curvularia or Bipolaris) is presented with persistent, low grade, smouldering type of keratitis with minimal structural alterations. Not infrequently, the necrotic slough may be pigmented. However, complication like perforation is less likely unless the cases is properly managed or augmented by steroids.

• Pseudallescheria boydii, often gives rise to severe form of keratitis with very poor clinical improvement, in spite of all possible medical therapy and may thus require surgical intervention.

• In contrast to the features of certain difficult filamentous fungal infections enumerated above, the stromal keratitis due to yeasts quite often resembles bacterial keratiits and thus can usually be managed with recommended antifungals.

Influence of fungal species on clinical presentation, therapeutic management and outcome of infection

• برای ایزوله های کاندیدای مقاوم به فلوکونازول، وریکونازول نسبت به ایتراکونازول ارجح است.

• آزمایش تعيين حساسيت داروهای ضدقارچی برای تجویز داروی مناسب به كلينيسين كمک ميكند.

• انتخاب داروی مناسب بويژه برای بيمارانييکه به درمان اوليه پاسخ نداده اند بسيار حياتي است. همچنين درمانهای ناکافي منجر به عوارض جدي مانند اندوفتالميت شده است.
F. solani

C streak
Aureobasidium pullulans

Aspergillus terreus
Bacteria & mould collected from the air on TSA-agar