Diagnosis and Management of Acanthamoeba Keratitis

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Acanthamoeba: Biology

- Free-living protozoan
- Ubiquitous in soil, sand, water
- Classification
  - 15 genotypes (T1-T15)
- Life Cycle

Acanthamoeba keratitis: Risk Factors

- Contact lens wear
  - Soft contacts
  - Orthokeratology
- Contact lens solutions
- Water
  - lakes, pools, hot tubs
  - Cleaning contacts with water
- Agricultural trauma
- Topical corticosteroids

Acanthamoeba keratitis: Diagnosis

- Clinical examination
- Corneal scrapings
  - Smear
  - Culture
  - PCR
- Confocal microscopy
Examination

• Signs
  – Early
    • Punctate epitheliopathy
    • Pseudodendrites
    • Perineural infiltrates
    • Reduced corneal sensation
  – Late
    • Stromal ring infiltrate
    • Anterior uveitis
    • Hypopyon
    • Immune-mediated scleritis

Corneal scrapings

• Smear
  – Giemsa
  – Calcofluor white, acridine orange, hematoxylin eosin
  – 33-50% sensitive
  – Very high specificity
Corneal scrapings

• Culture
  – Non-nutrient agar with *E. coli* overlay
  – May take weeks to grow
  – Gold standard
  – Sensitivity often depends on the lab
    • Reports range from 7-73%
  – Very high specificity

Corneal scrapings

• PCR
  – Collect on Dacron swab
  – Several different primers (18S rRNA)
  – Qualitative and real-time PCR assays
  – In 2 small series:
    • Sensitivity: 100%
    • Specificity: 100%
In Vivo Confocal Microscopy

• Pros:
  – Non-invasive
  – Follow patients over time
  – Visualize cysts in deep stroma
• Cons
  – Requires patient cooperation
  – Requires experience to interpret confocal images
  – Cannot determine viability of cysts

In Vivo Confocal Microscopy

• Sensitivity
  – 1 Retrospective study: 93%
  – 2 Prospective studies: 80-100%
• Specificity
  – 1 Retrospective study: 77%
  – 2 Prospective studies: 84-100%

Medical Treatment

• Trophozoites: easy to clear
• Cysts: difficult to clear
  – Minimum Cysticidal Concentration (MCC)
**Biguanides**

- Examples:
  - PHMB 0.02%
  - Chlorhexidine 0.02%
- Dose is >100 times the MCC
- First-line agent
- Higher dose in resistant cases (0.04%, 0.06%)

**Diamidines**

- Examples:
  - Propamidine (Brolene) 0.1%
  - Hexamidine (Desomedine) 0.1%
- Dose is usually >20 times the MCC
  - But wider variation in MCC than with biguanides
- Second-line agent
  - Often used in combination with a biguanide

**Others**

- Azoles:
  - Oral ketoconazole, itraconazole, voriconazole
  - Third-line agents
- Neomycin
  - Usually not cysticidal
  - Epithelial toxicity
  - Not recommended for acanthamoeba
- IV Pentamidine
- Collagen cross-linking?

**Controversies**

- Monotherapy vs. Combination therapy
- Topical corticosteroids
- Therapeutic keratoplasty
UCSF/Proctor Acanthamoeba Study

• In collaboration with UIC and Aravind
  – Funded by Research to Prevent Blindness
• Currently enrolling any patients suspicious for acanthamoeba keratitis
• We will perform diagnostic testing:
  – Culture
  – Smear
  – PCR
  – Confocal