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*Pseudomonas aeruginosa* and the Role of Fortified Antibiotics with the Additional Corticosteroid therapy when compliance is questioned.

Abstract

An elderly contact lens wearer presents with red painful eye with mucopurulent discharge. Cultures indicate *Pseudomonas aeruginosa* the causative organism. There is questionable compliance with fortified antibiotics, while the addition of Corticosteroids significantly improves signs.

Case History

A 73 year old African American male presents for evaluation of a red painful left eye. The patient reports 10 out of 10 pains with extreme discharge and photophobia. He reports not being able to open his eye due to the eyelashes being matted shut from discharge. The pain began three days ago and has progressively worsened. At the time of onset he was wearing his contacts and removed them instantly and threw away the contacts and case. The patient reports being a non compliant contact lens wearer for over 20 years, but otherwise has no other significant ocular history. Systemic history is positive for hypertension and rheumatoid arthritis. Our patient is not a smoker and denies alcohol, drug or caffeine use. Patient medications include low dose aspirin, tamsulosin, lisinopril, gelnique, methotrexate, simvastatin, potassium, coreg, folic acid and finasteride.

Pertinent findings

On initial visit, slit lamp exam is significant for the left eye, showing mucopurulent discharge matting the eyelids closed. The discharge is carefully removed and lids opened to reveal grade 4+ chemosis and injection of the palpebral and bulbar conjunctiva. The cornea is edematous from limbus to limbus with grade 4+ stromal edema. A round 4.5 mm corneal infiltrate with overlaying staining is present. The anterior chamber is difficult to assess, however a 2mm hypopyon is noticeably present inferiorly.

Visual acuities, pupils and extraocular muscles are unable to be completed of the left eye due to the patient’s pain levels. Cultures are obtained from the lower fornix as well as baseline external photos.

Differential

1. **Bacterial keratitis**
   a. *Pseudomonas aeruginosa*
   b. *Staphylococcus*
   c. *Streptococcus*
   d. *Moraxella*
   e. *Serratia*
2. Acanthamoeba keratitis  
   a. protozoan
3. Fungal keratitis  
   a. Filamentous  
      i. Fusarium  
      ii. Aspergillus  
   b. Nonfilamentous  
      i. Candida

Diagnosis and Discussion-All findings and details are given about the left eye only.

- Diagnosis  
  o Pseudomonal keratitis  
  - The patient’s culture came back positive for *Pseudomonas aeruginosa* as well as a coagulase negative staphylococcus species.

Microbial keratitis is characterized by an acute defect in the corneal epithelium with underlying inflammation due to the replication of the bacterial organism. Most bacterial organisms can penetrate the cornea only when it has been compromised; however there are a handful of organisms that can penetrate an intact epithelium. These organisms include *N. Gonorrhoeae, N. meningitidis, C. diphtheria* and *H. influenza*. Microbial keratitis is a true ocular emergency due to the aggressive nature of ocular infections. Of the causative organisms of bacterial keratitis, *Pseudomonas aeruginosa* is responsible for up to 39% of the cases of bacterial keratitis in the United States and up to 60% of contact lens keratitis. It is known to be a more virulent presentation than other bacterial keratitis. *Pseudomonas aeruginosa* is commonly associated with having a higher association in males. It is a gram negative bacillus often found in the gastrointestinal tract.

The incidence of contact lens related bacterial keratitis is approximately 1 in 2500 contact lens wearers who wear their contacts on a daily basis and remove them nightly. The incidence rises drastically to 1 in 500 in the contact lens wearers who choose to wear their lenses on a continuous or extended wear basis. A large multicultural study showed that Pseudomonas ulcers had a significantly worse visual outcome than patients with other bacterial ulcers. *Pseudomonas* is also associated with larger corneal ulcers than other bacterial strands. Due to the poor visual outcome in these patients it is crucial to know which organism is present. Culturing the ulcer is the best indicator.

Any corneal infiltrate or ulcer of 1-2mm in the visual axis should ideally be cultured. With the increasing isolation of antibiotic resistant microbes, bacterial cultures have become more important now than ever. A variety of different agar plates should be inoculated with each culture, including chocolate agar, sheep blood agar, sabouraud’s agar and thioglycolate both. Each agar has different nutrients for different bacteria, and blood agar allows most bacteria to grow. The Sabouraud dextrose agar allows fungi to grow, and chocolate agar is ideal for the *Haemophilus* and *Neisseria gonorrhoeae* species. Lastly the Thioglycolate broth tests for both aerobic and anaerobic bacteria.

Treatment & Management-All findings and details are given about the left eye only.
• Day 1:
  o Started on fortified Vancomycin 50mg/cc every hour and fortified Tobramycin 25mg/cc every hour into the left eye.
    ▪ On alternating half hours.
  o Due to the lack of understanding from the patient, it is stressed that this is a very serious and permanent vision threatening condition and possibly loss of eye. The patient is educated that he needs to be seen daily in the office until the epithelium of the ulcer heals.
  o Corneal transplantation is discussed with the patient, stressing that this will be a long healing process with the likelihood of scar formation causing reduced vision.
  o A baseline photo external photo is taken.

• Day 2
  o Patient reports not being able to use either antibiotic that was prescribed to him, resulting in no improvement in signs or symptoms.
  o Subconjunctival injections of 25mg Vancomycin and 20 mg of Tobramycin are completed without complications.
  o The patient is extensively educated on the serious nature of the infection that is present in his eye and stressed importance of good compliance with his medications.

• Day 3-6:
  o The patient returns daily with questionable compliance of his antibiotic drops.
  o Hypopyon shows small signs of resolution.
  o Corneal epithelium show slow signs of improvement and re-epithelialization.
  o External photos taken for progress reports

• Day 7:
  o Start Pred Forte four times a day into the left eye.
  o Reduce fortified tobramycin and vancomycin to every hour into the left eye on alternating hours
  o Reduced subjective pain.
  o Lids/Lashes
    ▪ Minimal debris
  o Conjunctiva
    ▪ Gr 2-3+ chemosis
    ▪ 4+ Injection
  o Cornea
    ▪ Epithelium is 85% healed.
    ▪ Dense 4.5mm central infiltrate.
    ▪ Stromal edema surrounding infiltrate is reduced to grade 2-3+
  o Anterior chamber
    ▪ Hypopyon is minimal

• Day 8:
  o Lids/Lashes
- Minimal debris
  - Conjunctiva
    - Gr 2+ chemosis
    - 4+ Injection
  - Cornea
    - Epithelium is 80% healed.
    - 4.5mm central infiltrate-able to poorly see iris through infiltrate
    - Stromal edema surrounding infiltrate is reduced to grade 2+
  - Anterior chamber
    - Hypopyon is resolved
  - External photos are taken to document improvement.

**Day 12:**
- Reduce fortified Tobramycin and Vancomycin to every four hours into the left eye.
- Pain has diminished.
- Lids/Lashes
  - Minimal debris
- Conjunctiva
  - Gr 1+ chemosis
  - 4+ Injection
- Cornea
  - Epithelium is 90% healed.
  - 4.5mm central infiltrate-able to poorly see iris through infiltrate
  - Stromal edema surrounding infiltrate, grade 2+.
  - External photos are taken to document improvement.
- Compliance is questioned due to minimal improvement of injection.

**Day 17:**
- Reduce Fortified Tobramycin and Vancomycin to four times a day into the left eye.
- Pred Forte QID into the left eye is continued.

**Day 23:**
- Lids/Lashes
  - Minimal debris
- Conjunctiva
  - Gr 1+ chemosis
  - 4+ Injection
- Cornea
  - Epithelium is 100% healed.
  - 4.5mm central infiltrate-
  - Stromal edema surrounding infiltrate is grade 2+
  - Reduce fortified Tobramycin and Vancomycin to twice a day into the left eye for 5 days then reduce to once daily until follow up.
  - Continue Pred Forte four times a day.
• Day 30:
  o Switch to Tobradex three times a day into the left eye in order to improve compliance.
  o Patient’s visual acuity is stable at hand motion only.
  o Patient extensively educated on the likelihood of a corneal transplant needed in order to improve the visual acuity of the left eye. Stressed that his importance compliance is to help benefit his long term visual potential of his left eye.

**Conclusion**

Pseudomonas ulcers are known for responding poorly to treatments and causing a worse visual outcome than other bacterial keratitis. The patient’s understanding of the ocular infection and the severity of the infection is crucial for the healing process. Comprehension that this infection will take months to resolve and may result in corneal transplants in order to have the best visual outcome possible. Strong encouragement of compliance with antibiotic and steroid dosing is a responsibility of the rendering doctor and one that could make the difference in the outcome of a patient.

Corticosteroids have been known as a controversial adjunctive therapy, especially for *Pseudomonas* ulcers. They have been shown to reduce the inflammatory response that may be damaging to the cornea; however they have also been shown slow the process of wound healing. There have been many multivariate studies showing that there is improvement of visual outcome without evidence of increased adverse effects when using corticosteroids during the healing process of corneal ulcers. The lack of adverse effects with corticosteroids is a strong support to use corticosteroids on a patient as soon as it is deemed safe. This will allow for being confident in giving the best possible visual outcome for a patient with maximal topical treatment.