Clinical Features, Antibiotic Susceptibility Profile, and Outcomes of Infectious Keratitis Caused by *Stenotrophomonas maltophilia*

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Disclosures

I have no financial interests or relationships to disclose.
Let’s start with a case...

- 55 yo contact lens wearer presents with a 3 x 3 mm corneal ulcer

- Cultures are taken and he is started on empirical antibiotic therapy with fortified vancomycin (25 mg/mL) and tobramycin (14 mg/mL)
Two days later...much worse!

- Ddx: fungus?, acanthamoeba?, atypical mycobacterium?
- Culture results: *Stenotrophomonas maltophilia*
- Resistant to Vancomycin, Tobramycin, Ceftazidime
- Sensitive only to fluoroquinolones!!
Stenotrophomonas maltophilia: An emergent global opportunistic pathogen

- Ubiquitous, aerobic, motile Gram-negative bacillus

- It primarily affects hospitalized and debilitating hosts, and it rarely causes ocular infections
Resistant to the aminoglycosides and cephalosporins, which are typically used for empiric broad spectrum gram negative coverage as fortified antibiotics
To describe the risk factors, antibiotic susceptibility profile & treatment outcomes of infectious keratitis caused by *Stenotrophomonas maltophilia*
Methods & Demographics

Retrospective case series of 26 eyes of 26 patients (mean age, $66.2 \pm 20.2$ years) who were treated at the Bascom Palmer Eye Institute for a *S. maltophilia* corneal ulcer.

**Setting**
Bascom Palmer Eye Institute

**Time frame**
1987 to 2014

**Inclusion/Exclusion Criteria**

**In:** Culture-positive *S. maltophilia* corneal ulcer

**Out:** Other viral, bacterial, fungal or parasitic ulcers
Main Outcome Measures

➢ Predisposing Factors
➢ Vision at presentation & after treatment
➢ Antibiotic susceptibility
➢ Treatment selection
➢ Clinical outcomes
Clinical Features, Antibiotic Susceptibility Profile, and Outcomes of Infectious Keratitis Caused by *Stenotrophomonas maltophilia*

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*Terrence P. O’Brien, MD,* *Eduardo C. Alfonso, MD,* and *Oriel Spierer, MD*

**Purpose:** *Stenotrophomonas maltophilia*, an uncommon cause of infectious keratitis, is difficult to treat because of its resistance to multiple antibiotics. The purpose of this study is to describe the clinical features, antibiotic susceptibility profile, and outcomes of *S. maltophilia* keratitis.

**Methods:** A retrospective review of records from 1987 to 2016 identified 26 eyes of 26 patients who were treated at the Bascom Palmer Eye Institute for an *S. maltophilia* corneal ulcer. Clinical data were analyzed as to predisposing factors, clinical presentation, antibiotic susceptibility, treatment selection, and clinical outcomes.

**Results:** Median age at presentation was 65 years (range, 16–98). Twelve patients were using topical corticosteroids, 8 patients had a history of penetrating keratoplasty, and 9 were contact lens wearers. All patients received topical antibiotics. 2 required thera-
and cephalosporins, which are typically used for empiric broad-
spectrum gram-negative coverage as fortified solutions. Fluoroqui-
nolones and polymyxin B/trimethoprim should be considered instead in cases of *S. maltophilia* infection.

**Key Words:** antimicrobial susceptibility, infectious keratitis, *Stenotrophomonas maltophilia*, *Pseudomonas aeruginosa*, fluoroquino-
lones, aminoglycosides

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*Stenotrophomonas maltophilia* is an aerobic, motile gram-
negative bacillus that is ubiquitous in nature.¹ It has been isolated from plants, animals, soil, and even nutrient-poor aqueous environments.² In recent years, it has emerged as an opportunistic pathogen because of its intrinsic resistance to
## Cases, Treatment Strategies, and Outcomes of *S. maltophilia* keratitis

<table>
<thead>
<tr>
<th>N</th>
<th>Year</th>
<th>Visual Acuity at Presentation</th>
<th>Predisposing factor</th>
<th>Concomitant Pathogen</th>
<th>Treatment*</th>
<th>Visual Acuity at Last Follow-up Examination</th>
<th>Antibiotic Treatment Duration (wk)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1987</td>
<td>20/200</td>
<td>PKP, topical corticosteroids</td>
<td></td>
<td>Fortified cefazolin and tobramycin, gentamicin</td>
<td>20/50</td>
<td>3</td>
<td>Resolved</td>
</tr>
<tr>
<td>2</td>
<td>1991</td>
<td>2/200</td>
<td>PKP, topical corticosteroids</td>
<td><em>Micrococcus</em></td>
<td>Fortified vancomycin and tobramycin, ciprofloxacin</td>
<td>4/200</td>
<td>2.5</td>
<td>Therapeutic PKP</td>
</tr>
<tr>
<td>3</td>
<td>1989</td>
<td>20/100</td>
<td>Soft contact lens wearer</td>
<td><em>Mycobacterium abscessus</em></td>
<td>Fortified cefazolin and tobramycin</td>
<td>20/40</td>
<td>5</td>
<td>Resolved</td>
</tr>
<tr>
<td>4</td>
<td>1999</td>
<td>1/200</td>
<td>1 week post-LASIK, topical corticosteroids</td>
<td></td>
<td>Amikacin, clarithromycin, LASIK flap amputation due to melt</td>
<td>20/100</td>
<td>15</td>
<td>Resolved with scarring</td>
</tr>
<tr>
<td>5</td>
<td>1996</td>
<td>Hand motion</td>
<td>None</td>
<td><em>Staphylococcus aureus</em>, <em>Klebsiella</em> spp., <em>Streptococcus mitis</em></td>
<td>Ofloxacin, fortified vancomycin and ceftazidime</td>
<td>20/80</td>
<td>4</td>
<td>Corneal scar, pupillary membrane</td>
</tr>
<tr>
<td>6</td>
<td>1997</td>
<td>Hand motion</td>
<td>PKP, topical steroids, loose suture</td>
<td></td>
<td>Fortified vancomycin and tobramycin, polymyxin B/trimethoprim</td>
<td>Hand motion</td>
<td>0</td>
<td>Resolved with significant scarring</td>
</tr>
<tr>
<td>7</td>
<td>1996</td>
<td>Hand motion</td>
<td>Non-healing corneal epithelial defect, topical corticosteroids</td>
<td></td>
<td>Ofloxacin, polymyxin B/trimethoprim</td>
<td>5/200</td>
<td>8</td>
<td>Resolved with scarring and central thinning</td>
</tr>
<tr>
<td>8</td>
<td>2010</td>
<td>20/30</td>
<td>LASIK, epithelial ingrowth</td>
<td></td>
<td>Fortified vancomycin and tobramycin, moxifloxacin</td>
<td>20/20</td>
<td>10</td>
<td>Resolved</td>
</tr>
<tr>
<td>9</td>
<td>2010</td>
<td>20/200</td>
<td>PKP, topical corticosteroids</td>
<td><em>Pantoea</em> spp.</td>
<td>Moxifloxacin</td>
<td>20/80</td>
<td>2</td>
<td>Resolved with scarring</td>
</tr>
<tr>
<td>10</td>
<td>2009</td>
<td>20/50</td>
<td>Soft contact lens wearer</td>
<td><em>Fusarium</em> spp. (light growth)</td>
<td>Fortified vancomycin and gatifloxacin, natamycin</td>
<td>20/25</td>
<td>12</td>
<td>Resolved</td>
</tr>
<tr>
<td>11</td>
<td>2008</td>
<td>No light perception</td>
<td>Neurotrophic cornea, blind eye</td>
<td></td>
<td>Fortified vancomycin, moxifloxacin, fortified tobramycin</td>
<td>N/A</td>
<td>N/A</td>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>N</td>
<td>Year</td>
<td>Visual Acuity at Presentation</td>
<td>Predisposing factor</td>
<td>Concomitant Pathogen</td>
<td>Treatment*</td>
<td>Visual Acuity at Last Follow-up Examination</td>
<td>Antibiotic Treatment Duration (wk)</td>
<td>Outcome</td>
</tr>
<tr>
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</tr>
<tr>
<td>12</td>
<td>2005</td>
<td>Count fingers</td>
<td>PKP, topical corticosteroids</td>
<td>Methicillin resistant <em>Staphylococcus aureus, Escherichia coli</em></td>
<td>Fortified vancomycin and tobramycin with cefazolin</td>
<td>N/A</td>
<td>N/A</td>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>13</td>
<td>2005</td>
<td>Hand motion</td>
<td>PKP, topical corticosteroids</td>
<td></td>
<td>Fortified cefazolin, moxifloxacin</td>
<td>20/200</td>
<td>5</td>
<td>Therapeutic PKP due to perforation</td>
</tr>
<tr>
<td>14</td>
<td>2003</td>
<td>20/25</td>
<td>Rigid gas permeable lens user</td>
<td></td>
<td>Levofloxacin</td>
<td>20/20</td>
<td>1</td>
<td>Resolved</td>
</tr>
<tr>
<td>15</td>
<td>2001</td>
<td>9/200</td>
<td>PKP, topical corticosteroids</td>
<td></td>
<td>Fortified cefazolin and tobramycin</td>
<td>20/25</td>
<td>4</td>
<td>Resolved</td>
</tr>
<tr>
<td>16</td>
<td>2001</td>
<td>Count fingers</td>
<td>Exposure keratopathy</td>
<td><em>Burkholderia cepacia</em></td>
<td>Fortified cefazolin and tobramycin, natamycin</td>
<td>Hand motion</td>
<td>8</td>
<td>Resolved with significant scarring</td>
</tr>
<tr>
<td>17</td>
<td>2014</td>
<td>20/20</td>
<td>Trauma, HIV</td>
<td><em>Curvularia spp.</em></td>
<td>Ciprofloxacin, fortified tobramycin, natamycin</td>
<td>20/25</td>
<td>2</td>
<td>Resolved</td>
</tr>
<tr>
<td>18</td>
<td>2011</td>
<td>20/40</td>
<td>Soft contact lens wearer</td>
<td><em>Pseudomonas aeruginosa, Serratia marcescens</em></td>
<td>Fortified vancomycin and tobramycin</td>
<td>20/20</td>
<td>2</td>
<td>Resolved</td>
</tr>
<tr>
<td>19</td>
<td>2012</td>
<td>20/25</td>
<td>Soft contact lens wearer</td>
<td></td>
<td>Moxifloxacin</td>
<td>20/20</td>
<td>3</td>
<td>Resolved</td>
</tr>
<tr>
<td>20</td>
<td>2011</td>
<td>9/200</td>
<td>Boston KPro, topical corticosteroids</td>
<td></td>
<td>Fortified vancomycin and tobramycin, moxifloxacin</td>
<td>8/200</td>
<td>2</td>
<td>Resolved</td>
</tr>
<tr>
<td>21</td>
<td>2014</td>
<td>20/30</td>
<td>LASIK, epithelial ingrowth</td>
<td></td>
<td>Polymyxin B/trimethoprim, besifloxacin</td>
<td>20/30</td>
<td>2</td>
<td>Resolved</td>
</tr>
<tr>
<td>22</td>
<td>2013</td>
<td>No light perception</td>
<td>Recent EDTA chelation, topical corticosteroids, blind eye</td>
<td></td>
<td>Fortified vancomycin, polymyxin B/trimethoprim</td>
<td>No light perception</td>
<td>4</td>
<td>Enucleation due to recurrence, blind painful eye</td>
</tr>
</tbody>
</table>
Predisposing Factors

- 25 out of 26 patients had a risk factor for infectious keratitis
- In 13 patients there was a combination of risk factors
  - PKP: 8 patients
  - Contact lens wearers: 9 patients
  - Non-healing epithelial defect: 3 patients
  - Recent surgery (LASIK, EDTA chelation): 2 patients
  - Hx of epithelial ingrowth: 2 patients
  - Hx of Boston KPro: 2 patients
  - Hx of trauma: 1 patient
Antibiotic Susceptibility Profile of *S. maltophilia* isolates

- 90% sensitive to fluoroquinolones (ciprofloxacin, levofloxacin)
- 77% sensitive to polymyxin B and/or trimethoprim/sulfamethoxazole
- 60% sensitive to the cephalosporins (ceftazidime/ceftriaxone)
- ONLY 30% sensitive to the aminoglycosides (genta/tobramycin, amikacin)
Clinical Presentation & Treatment

➢ Vision at presentation
  • 15/26 patients had vision worse than 20/400

➢ Clinical exam
  • 16/26 with central infiltrate, 5 with hypopyon

➢ Treatment
  • Vancomycin/Ceftazidime and Tobramycin
  • In all cases a fluoroquinolone or polymyxin B/trimethoprim was added after culture results
Clinical Outcomes

➢ Vision at presentation
  • 15/26 patients had vision worse than 20/400
  • 15/26 patients had vision better than 20/100

➢ Vision at last follow up visit
  • 15/26 patients had vision better than 20/100

➢ Outcomes
  • Resolved with minimal scarring (50%)
  • Resolved with significant scarring (20%)
  • Therapeutic penetrating keratoplasty (8%)
  • Enucleation (4%)
  • LASIK flap amputation (4%)
In summary...

- Largest case series on *S. maltophilia* cornea ulcers
- Risk factors for infections include history of corneal transplant, ocular surface compromise and contact lens wear
- *S. maltophilia* is a gram negative pathogen with inherent resistance to aminoglycoside and cephalosporin antibiotics
- 90% of the isolates were sensitive to the fluoroquinolones and ONLY 30% were sensitive to the aminoglycosides
Acknowledgements

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