Surgical Infection

Clinical Experience in THR

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Burkholderia cepacia

Epidemic outbreak of surgical site infection at

Clinica Veterinaria Vezzoni - Cremona, Italy
Clinical experience of epidemic outbreak

- Positive culture for *Burkholderia cepacea* in the surgical wound end of surgery, as routine culture, in June 2008
- Repeatedly positive in the following months
- Negative culture for BCC from the surgical environment (walls, floor, drapes, gloves, air conditioned, saline solutions, staff, etc.)
- No systemic signs in the post-op
- OR decontamination with ozone
Clinical experience of epidemic outbreak

- Positive culture at the end of surgery
- Positive culture at the surgical approach
- Positive culture of synovial taps before THR
- Saprophyte bug? Lab bug?
Clinical experience of epidemic outbreak

- Several symptomatic cup loosening 2 to 10 months after surgery
Clinical experience of epidemic outbreak

- Several symptomatic cup loosening 2 to 10 months after surgery
- Positive culture of fibrous tissue behind the cup
BCC - *Burkholderia cepacia complex*

- Aerobic Gram-negative bacteria
- Different species (at least nine)
- Found in aquatic environments
- Low virulence, but induction of inflammation
- Causing pneumonia in people with underlying cystic fibrosis
- Specific media for its culture
- No reports (yet) in veterinary medicine
BCC - Burkholderia cepacia complex

- Agricultural use of BCC as a biopesticide
- Tap water contamination worldwide
- Human and animal health hazard
- Colonizer of fluids used in the hospital
- Wide documentation in the web
Clinical experience of epidemic outbreak

- Bacterial sensitivity

- Amikacine S
- Amoxi+clav. ac. R
- Cefadroxile R
- Cefalexine R
- Cefazoline R
- Ceftazidime S
- Ceftriaxone S
- Ciprofloxacine S
- Enrofloxacine S
- Gentamicine S
Clinical experience of epidemic outbreak

- Where was the bug coming from?
- Human Hospital Dept. of Infectious Diseases
- Check the pipe water!
BCC - Burkholderia cepacia complex

Clinical experience of epidemic outbreak

- Positive culture from the tap water in the Hospital
## Waterborne pathogens and their significance in water supplies

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Health significance</th>
<th>Persistence in water supplies</th>
<th>Relative infectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Campylobacter jejuni, C. coli</em></td>
<td>High</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Pathogenic <em>Escherichia coli</em></td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Enterohaemorrhagic <em>E. coli</em></td>
<td>High</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td><em>Legionella</em> spp.</td>
<td>High</td>
<td>Multiply</td>
<td>Moderate</td>
</tr>
<tr>
<td>Non-tuberculosis mycobacteria</td>
<td>Low</td>
<td>Multiply</td>
<td>Low</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>Moderate</td>
<td>May multiply</td>
<td>Low</td>
</tr>
<tr>
<td><em>Salmonella typhi</em></td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Other salmonellae</td>
<td>High</td>
<td>Short</td>
<td>Low</td>
</tr>
<tr>
<td><em>Shigella</em> spp.</td>
<td>High</td>
<td>Short</td>
<td>Moderate</td>
</tr>
<tr>
<td><em>Vibrio cholerae</em></td>
<td>High</td>
<td>Short</td>
<td>Low</td>
</tr>
<tr>
<td><em>Burkholderia pseudomallei</em></td>
<td>Low</td>
<td>May multiply</td>
<td>Low</td>
</tr>
<tr>
<td><em>Yersinia enterocolitica</em></td>
<td>High</td>
<td>Long</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Source:** WHO Guidelines for drinking-water quality, 2006.
Clinical experience of epidemic outbreak

- Burkholderia in the pipe water
- How did it contaminate the patient?
- In surgery?
- All cultures were negative in the surgical environment!
Clinical experience of epidemic outbreak

- Occasional observation at the end of one day several months later
- Storing unused IV solution in the fridge

BCC - Burkholderia cepacia complex
• Following day: positive culture of diluted fentanyl in the intravenous pump set

• Negative culture of fentanyl vials

Clinical experience of epidemic outbreak

BCC - Burkholderia cepacia complex
Pathways of contamination

- Washing hands with contaminated water
From tap water to the patient:

- Contaminated washed hands of nurses and anesthetists
- Anesthesia induction
Peri-operative contamination pathways

- Contaminated hands of nurses and anesthesia staff
  - Contamination of IV catheters and infusion sets and vials
  - Contamination of IV solutions
Peri-operative contamination pathways

✓ Contaminated IV solutions
  ‣ Time-related bacterial replication
  ‣ Preserved solution > replication and higher contamination
  ‣ Contamination of the patient’s blood stream
Peri-operative contamination pathways

✓ Contaminated infused solutions
  ‣ Hematogenous bacterial contamination and transient bacteremia
  ‣ Contamination of the surgical field
  ‣ Bacterial growth in blood clots and dead tissue
Clinical experience of epidemic outbreak

- Low morbidity, but:
  - Local inflammation
  - Inhibition of osteointegration
  - Affecting the cup, not the stem
  - Cup more susceptible
  - No observed consequences on other surgical procedures
  - Immune host defenses
Clinical experience - cup revisions

- 40 revisions for cup loosening among 136 cases
- 30% in 12 months time frame
- No complications in the remaining cases
BCC - Burkholderia cepacia complex

Clinical experience - cup revisions

- Positive culture for BCC in both the synovial fluid and the loose cup membrane up to 3 months after surgery
- Positive culture for BCC in the loose cup membrane only from 3 to 8 months after surgery
- Negative culture for BCC in the synovial fluid and in the loose cup membrane from 8 months after surgery
BCC - Burkholderia cepacia complex

Clinical experience - cup revisions

- Surgical revision for cup loosening
- Septocoll®
Clinical experience - cup revisions

- Surgical revision for cup loosening
- Kyon Revision cup
- High success rate, > 90%

BCC - Burkholderia cepacia complex
Clinical experience - cup revisions

- Simba, GSD, M, 2 yr., 33 kg
- THR cup loosening 2 mo. post-op
- Surgical revision
- Culture: *Burkholderia cepacia*
- Revision cup
- Septocoll
- Ciprofloxacin for 3 months

Post Op

FU 2 years
Counter measures

- Disposable gloves for handling animal and infusion set and solution, frequent change
- Hydro-alcoholic antiseptic gel
BCC - *Burkholderia cepacia complex*

**Counter measures**
Counter measures

- Individual pump solution and IV lines and/or fluids
- Discard any remnants
BCC - Burkholderia cepacia complex

Counter measures

- Individual scrub can, steam sterilized
- Individual prep solutions
**BCC - Burkholderia cepacia complex**

**Counter measures**

- Limit the number of blood stream accesses (ASA risk)
- Every blood stream access is a potential source of hematogenous infection
- Remove IV catheters asap after recovery from surgery
Counter measures

- Effective to counteract other bacteria with the same possible pathway of contamination:
  - Other gram neg. bacteria:
    - *Serratia marcescens*
    - *Pseudomonas aeruginosa*
    - *Stenotrophomonas maltophilia*
Conclusions

- Awareness of BCC potential risk
- Especially for THR (unforgiving any contamination)
- Effectiveness of prevention measures
- Focused on the HANDS
- No more BCC culture in our cases since over three years
Hand as a source of infection

- Waterborne bacteria
- Environmental bacteria
- Bacteria from contaminated disinfectant solutions
- Bacteria from staff
- Bacteria from patient

Infector hand
Prevention strategies for infection

✓ PREVENTION

- Primary responsibility of the surgeon
- Chief of the surgical team
- Advocated on behalf of the patient to drive the environment and the staff to decrease the infection rate
- Do not allow yourself & your staff to become an infector
130 years after, surgical infection is still an issue