A Comparison of Endoscopic Culture Techniques for Chronic Rhinosinusitis

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**Acute rhinosinusitis**
- Empiric antibiotic therapy

**Chronic rhinosinusitis:**
- Uncertainty about causative agent.
- Increasing antibiotic resistance.
- Failure with multiple anti-biotic regimens.
  - → culture-directed antibiotic therapy.

**Cultures via directed puncture:**
- Gold standard, least contamination.
- Unpleasant, local anesthesia.
- Injury to teeth, eye, infraorbital nerve, lacrimal apparatus.
Nasal or nasopharyngeal swabs:
- Contamination by nasal flora.
- Endoscopically guided sinus cultures.
- Sterile calcium-alginate-tipped applicators (calgie swabs).

Endoscopically suction aspiration of sinus secretions.
- Less risk of contamination than swab.
- Larger culture samples.

This study:
- Endoscopic swab
- Endoscopic suction aspiration
- Culture results, contamination rates.
Chronic rhinosinusitis (CRS)
- University of Pennsylvania Medical Center.
- 1997/11/03 ~ 1998/03/23.
- 50 swab culture cultures, 50 suction aspiration.

Direct visualization by rigid nasal endoscopy.
- 1% ephedrine sulfate + 2% tetracaine solutions.
- 4mm 30° telescope.

Swab method
- Sterile cotton-tipped wire swab.
- Retracting the nasal ala with the endoscope.

Aspiration technique
- Sterile collection trap connected to suction.
MATERIALS AND METHODS

- Gram stain, aerobic bacterial culture with sensitivity testing.

- Cultures:
  - **Positive**: colonies > moderate number, or Gram stain organisms correlating with cultured microbes.
  - **Negative**: no growth > 48 hours
  - **Contaminated**: rare, or few *Staphylococcus coagulase-negative* (SCN) with negative Gram stain.

- **Contamination rates**
  - Chi-squared test, Yates' correction, 2 X 2 comparisons.
RESULTS

- 4-month period.
- 100 cultures from 81 patients with CRS.
- Ages: 14~77 years (mean, 47.95 years)

<table>
<thead>
<tr>
<th>Patient Population</th>
<th>Swab</th>
<th>Aspiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. patients</td>
<td>42</td>
<td>39</td>
</tr>
<tr>
<td>No. cultures</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Mean age (yr)</td>
<td>49</td>
<td>46</td>
</tr>
<tr>
<td>Gender</td>
<td>M 20 F 22</td>
<td>19 F 20</td>
</tr>
<tr>
<td>Current antibiotic use</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Current nasal irrigation use</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Current systemic steroid use</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Current topical steroid use</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>Asthma</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>ASA sensitivity</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Allergic rhinitis</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>Nasal polyps</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Allergy</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>Prior sinus surgery</td>
<td>28</td>
<td>26</td>
</tr>
</tbody>
</table>

ASA = acetylsalicylic acid.
RESULTS

Most prevalent bacteria: *Staphylococcus aureus*, SCN, *Pseudomonas aeruginosa*.

Contamination rates: not significantly different (chi-squared = 0.09, *p* = 0.75, at 95% confidence interval).

<table>
<thead>
<tr>
<th>Culture Results</th>
<th>Swab</th>
<th>Aspiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cultures</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>S. aureus</strong></td>
<td>12 (24%)</td>
<td>13 (26%)</td>
</tr>
<tr>
<td><strong>SCN</strong></td>
<td>5 (10%)</td>
<td>9 (18%)</td>
</tr>
<tr>
<td><strong>P. aeruginosa</strong></td>
<td>3 (6%)</td>
<td>6 (12%)</td>
</tr>
<tr>
<td>α-Hemolytic <em>Streptococcus</em></td>
<td>3 (6%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td><em>Serratia marcescens</em></td>
<td>2 (4%)</td>
<td>2 (4%)</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>2 (4%)</td>
<td>0</td>
</tr>
<tr>
<td><em>Moraxella catarrhalis</em></td>
<td>2 (4%)</td>
<td>0</td>
</tr>
<tr>
<td><em>Bordetella bronciseptica</em></td>
<td>0</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>Diphtheroids</td>
<td>0</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>1(2%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td><em>Klebsiella oxytoca</em></td>
<td>1(2%)</td>
<td>0</td>
</tr>
<tr>
<td><em>Stenotrophomonas maltophilia</em></td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td><em>Acinetobacter baumanii</em></td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td><em>Enterobacter species.</em></td>
<td>1(2%)</td>
<td>0</td>
</tr>
<tr>
<td><em>Streptococcus pneumonia</em></td>
<td>1(2%)</td>
<td>0</td>
</tr>
<tr>
<td><strong>No growth</strong></td>
<td>14 (28%)</td>
<td>14 (28%)</td>
</tr>
<tr>
<td><strong>Contaminate</strong></td>
<td>7 (14%)</td>
<td>5 (10%)</td>
</tr>
<tr>
<td><strong>Total positive cultures</strong></td>
<td>29 (58%)</td>
<td>31 (62%)</td>
</tr>
</tbody>
</table>
DISCUSSION

- **Antimicrobial therapy for acute rhinosinusitis**
  - Straight forward
  - Responsible organisms are well defined.

- **Treatment of CRS**
  - Fraught with complexity.
  - Failure in previous antibiotic therapy.
  - Typical pathogens are difficult to characterize.

- **Direct swab sample**
  - Contamination as swab inserted and withdraw from nasal vestibule.

- **Aspiration technique**
  - Suction trap may minimize contamination.
DISCUSSION

- **No significant difference**
  - Contamination rates, Negative culture rate
  - Number of isolates, Ongoing antibiotic therapy

- **Limitation of this study:**
  - Absence of anaerobic cultures.
  - Contributors to CRS?, negative cultures?
  - Swab form: sample size?

- **S. aureus, SCN, P. aeruginosa**

- **Gram-negative bacteria: 35% in CRS.**
DISCUSSION

**SCN**

- Normal nasal / sinus flora, regarded as contaminant.
- Non-classic pathogen: heavy growth is cultured from diseased sinuses.
- Gram stain: $10^4 \sim 10^5$/mL.
- Acute or subacute rhinosinusitis: infection $\approx 10^4$ CFU/mL.
- Potential pathogen: Gram stain(+) and/or grow in moderate ~ many colonies.
- Non-pathological: rare or few colonies.

**GNB: 67% with a history of sinus surgery.**
CONCLUSION

- Endoscopic swab and aspiration methods in CRS
  - No significant differences
    - Contamination rates.
    - Ability to isolate pathogens.
  - Most common pathogens:
    - S. aureus, SCN, P. aeruginosa.