Anaerobic Meningitis Due to Peptostreptococcus Species: Case Report and Review

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We describe a patient with postsurgical anaerobic meningitis due to Peptostreptococcus magnus.

In cases of meningitis associated with Peptostreptococcus species reported in the literature, the most common predisposing factors are meningocele fistulae and head-and-neck surgery. Most patients respond well to appropriate antimicrobial therapy. Surgical intervention may be required in some instances.

Anaerobic bacteria account for <1% of cases of acute bacterial meningitis [1], and there are few cases associated with Peptostreptococcus species reported in the literature [2–6]. We describe a patient with postsurgical anaerobic meningitis due to Peptostreptococcus magnus.

Case Report

A 52-year-old woman underwent a left retrolabyrinthine vestibular nerve section for chronic vertigo. The posterior fossa was entered, and CSF was aspirated. A cortical mastoidectomy was performed, and the mastoid cavity was packed with abdominal-wall fat. Perioperative prophylaxis with iv ceftriaxone (1 g q24h) and iv flucloxacillin (1 g q6h) was continued for 5 days postoperatively.

Three days after surgery, the patient complained of an occipital and periaural headache; 7 days later, photophobia, fever, and a posterior nasal drip developed. Physical examination revealed a temperature elevated to 38.5°C and neck stiffness, but there were no focal neurological signs. The peripheral blood WBC count was 13.7 × 10⁹/L (83% neutrophils). A CT scan of the cranium showed only postoperative changes. A lumbar puncture was performed, and the opening pressure was 23 cm H₂O. Evaluation of CSF revealed the following values: WBCs, 358 × 10⁶/L (54% polymorphonuclear leukocytes); RBCs, 6 × 10⁶/L; glucose, 24 mg/dL; protein, 64 mg/dL. No organisms were detected on gram staining. Blood cultures were negative for aerobic and anaerobic organisms.

A culture of CSF was negative for aerobic organisms, but CSF inoculated in chopped-meat glucose broth was turbid after 72 hours' incubation in air at 37°C. Gram-positive cocci (1-μm diameter) arranged in pairs were detected. The strictly anaerobic organisms were confirmed as P. magnus by using the RapID ANA II kit (Innovative Diagnostic Systems, Norcross, GA) and by detection of acetic acid production by use of gas-liquid chromatography. MICs obtained after 48 hours of anaerobic incubation were as follows: ceftazidime, 4 μg/mL; metronidazole, 0.006 μg/mL; penicillin G, 0.064 μg/mL; and vancomycin, 0.5 μg/mL (Etest, AB BIODISK, Solna, Sweden).

Therapy with iv ceftazidime (1g q8h), vancomycin (750 mg q12h), and ciprofloxacin (200 mg q12h) as instituted empirically after the CSF sample was obtained; symptomatic improvement was noted within 24 hours. Although the cranial CT scan and nuclear medicine studies did not demonstrate a CSF leak, a left mastoid and eustachian-tube obliteration was performed 2 weeks after the initial operation (4 days after the diagnosis of meningitis). Cultures of CSF obtained intraoperatively again yielded P. magnus. Four days after surgery, the patient had a persistent headache, and a lumbar puncture was performed; the opening pressure was 21 cm H₂O. Evaluation of CSF revealed the following values: WBCs, 137 × 10⁶/L (83% neutrophils); protein, 35 mg/dL; and protein, 64 mg/dL. No organisms were detected on a gram stain, and culture of CSF was negative. A lumbar CSF drain was inserted and left in situ for 4 days, and the headache resolved. A regimen of iv ceftazidime, ciprofloxacin, and vancomycin was continued for a total of 14 days, which was followed by therapy with metronidazole, 400 mg t.i.d. orally for an additional 14 days.

The patient was discharged 18 days after the second operation, but she was readmitted 14 days later with a persistent headache. Another cranial CT scan was obtained, and the results were unchanged. CSF was obtained, and the opening pressure was 20 cm H₂O; there was no CSF pleocytosis, and culture of the CSF was negative. The headache resolved and has not recurred; however, the original preoperative symptom of vertigo returned.

Discussion

Gram-positive anaerobic cocci have been recognized as human pathogens for at least 70 years. Early reports [7] described...
### Table 1. Details of reported cases of anaerobic meningitis associated with *Peptostreptococcus* species.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Age (y)/sex</th>
<th>Underlying condition(s)</th>
<th>Clinical features</th>
<th>Peripheral WBCs ($\times 10^9$/L)</th>
<th>WBCs (% polymorphonuclear leukocytes)</th>
<th>Glucose (mg/dL)</th>
<th>Protein (mg/dL)</th>
<th>Gram stain result</th>
<th>Organisms cultured</th>
<th>Antimicrobial therapy</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>[2]</td>
<td>5/F</td>
<td>Congenital dermal sinus, intrathecal communication</td>
<td>Fever, nuchal rigidity, headache, drowsiness</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>GPC</td>
<td><em>Peptostreptococcus magnus, Corynebacterium xerosis</em></td>
<td>Penicillin, sulfadimidine, metronidazole, vancomycin*</td>
<td>Meningitis resolved, left hemiparesis, complete recovery</td>
</tr>
<tr>
<td>[3]</td>
<td>55/F</td>
<td>Acoustic neuroma excised 5 days before onset</td>
<td>Headache, vomiting, drowsiness†</td>
<td>NA</td>
<td>331 (70)</td>
<td>23</td>
<td>151</td>
<td>NA</td>
<td><em>Peptostreptococcus micros</em></td>
<td>Penicillin</td>
<td>Complete recovery</td>
</tr>
<tr>
<td>[4]</td>
<td>49/F</td>
<td>Diabetes mellitus, rectal carcinoma, radiotherapy, meningogoodrectal fistula</td>
<td>Fever, nuchal rigidity, headache, vomiting</td>
<td>NA</td>
<td>2,200 (87)</td>
<td>0</td>
<td>141</td>
<td>GPC</td>
<td><em>Peptostreptococcus anaerobus</em></td>
<td>Ampicillin, chloramphenicol, metronidazole</td>
<td>Meningitis resolved, died 6 months later†</td>
</tr>
<tr>
<td>[5]</td>
<td>72/M</td>
<td>Chronic sinusitis, sinus squamous cell carcinoma resection 4 days before onset</td>
<td>Fever, nuchal rigidity, headache, confusion</td>
<td>20</td>
<td>3,485 (81)</td>
<td>8</td>
<td>189</td>
<td>Negative³</td>
<td><em>Bacteroides species Clostridium species P. magnus</em></td>
<td>Vancomycin, ceftazidime, ceftriaxone</td>
<td>Complete recovery</td>
</tr>
<tr>
<td>[6]</td>
<td>56/M</td>
<td>Metastatic colon carcinoma, radiotherapy, rectorotheal fistula</td>
<td>Fever, nuchal rigidity, headache, confusion</td>
<td>27</td>
<td>NA</td>
<td>3</td>
<td>1,530</td>
<td>GNB</td>
<td><em>Peptostreptococcus species, Clostridium species Veillonella species P. magnus</em></td>
<td>Ceftriaxone, gentamicin; then penicillin, metronidazole</td>
<td>Complete recovery</td>
</tr>
<tr>
<td>[PR]</td>
<td>52/F</td>
<td>Retrolabyrinthine vestibular nerve section 10 days before onset</td>
<td>Fever, nuchal rigidity, headache, confusion</td>
<td>13.7</td>
<td>358 (54)</td>
<td>24</td>
<td>99</td>
<td>Negative</td>
<td>P. magnus</td>
<td>Vancomycin, ceftazidime, ciprofloxacin, metronidazole</td>
<td>Complete recovery</td>
</tr>
</tbody>
</table>

**NOTE.** GNB = gram-negative bacilli; GPB = gram-positive bacilli; GPC = gram-positive cocci; NA = not available.

* Administered intraventricularly.
† Symptoms resolved then recurred 1 week later.
‡ No evidence of meningitis at autopsy.
§ Intracellular cocci noted on Wright-Gimia stain of CSF.
“anaerobic streptococci,” which would now be classified as *Peptostreptococcus* species. *P. magnus* is recognized as the most important pathogenic species of gram-positive anaerobic cocci [8–10].

*Peptostreptococcus* species are the second most common organism isolated in cases of anaerobic meningitis [3]. Six well-documented reports of anaerobic meningitis involving *Peptostreptococcus* species, including the present case, are summarized in table 1 [2–6]. Two other reports, which describe “anaerobic streptococci,” were not included [11, 12]. Meningitis developed in three patients after head-and-neck surgery. Two patients had meningorectal fistulae complicated by polymicrobial feculent meningitis including *Peptostreptococcus* species. CSF WBC counts ranged from 331 to \( >3,000/10^6/L \) and CSF glucose levels were decreased. Gram-positive cocci were detected on gram-stained CSF specimens in only two cases. All patients who received appropriate antimicrobial therapy recovered, but one patient had residual hemiparesis.

In the case reported herein, the probable source of *P. magnus* isolated from the CSF specimens was infected mastoid air spaces that were entered during the operative procedure. *Peptostreptococcus* species, including *P. magnus*, are commonly isolated from postsurgical head-and-neck wound infections [8, 13], and perioperative antibiotic therapy may not reduce the risk of infection [14]. Increased intracranial pressure probably contributed to the persistent headaches that occurred after the clinical and microbiological resolution of meningitis.

In the pre-antibiotic era, anaerobic meningitis was a uniformly fatal condition, but currently, at least two-thirds of patients who receive appropriate antibiotic therapy survive [3]. The antibiotics administered initially in the present case were not the optimal combination for peptostreptococcal meningitis. More than 80% of *Peptostreptococcus* isolates are susceptible to metronidazole, and \( >95\% \) are susceptible to \( \beta \)-lactam antibiotics, including cephalosporins and carbapenems [15]. Metronidazole, a bactericidal agent with good CNS diffusion, is the treatment of choice for anaerobic meningitis [16]. Surgical treatment (e.g., mastoidectomy) may be required for underlying head-and-neck infections.

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**References**