Pneumococcal endometritis with peritonitis: Case report and review of the literature

KI OSTROWSKA, MD, FRCPC, C ROTSTEIN, MD, FRCPC, JH THORNLEY, MD, FRCPC, LA MANDELL, MD, FRCPC

Pneumococcal peritonitis is a form of primary bacterial infection of the peritoneum occurring in children and adults (1,2). It can affect both healthy and immunocompromised individuals. The former group includes prepubertal and adolescent girls (3), women in the post partum period (4-7) and women using an intrauterine contraceptive device (IUCD) (8-11). The latter group includes patients with liver cirrhosis and ascites (12,13), patients with nephrotic syndrome (14), post splenectomy patients (12) and bone marrow transplant recipients (15). This paper presents a case of pneumococcal endometritis with peritonitis diagnosed clinically in a patient using tampons.

CASE PRESENTATION

A 22-year-old female university student was admitted to the hospital in November 1988 with a 12 h history of lower abdominal pain. The pain was associated with vomiting, diarrhea, fever and chills of 24 h duration. The patient was menstruating at the time and had not changed her tampon for 6 h. There was no dysuria, frequency, vaginal discharge or pruritus. She had a single sexual partner, with her last sexual contact being three days prior to her period. Cunnilingus was performed at that time.

The past medical history was significant for an episode of abdominal pain one year previously which necessitated admission to hospital. No for-
mal diagnosis was made, and the pain resolved spontaneously within one day. Most recently, the patient had been on oral contraceptives and gave no history of drug allergy.

Physical examination on admission revealed an acutely ill white female with a temperature of 39.1°C, blood pressure 80/60 mmHg, and heart rate of 120 beats/min. Physical examination was significant for a markedly tender abdomen in both lower quadrants with local rebound tenderness and guarding. Speculum examination revealed a pedunculated noninflamed polyp and a small amount of exudate pooled in the vaginal vault. Pelvic examination showed extreme tenderness on cervical movement and on bimanual palpation, but no masses were noted.

Laboratory studies revealed normal electrolytes, blood urea nitrogen, creatinine and urinalysis. Leukocytes were 14.6x10^9/L with 88% neutrophils and 3% band cells. Gram stain of the cervical swab demonstrated rare polymorphs and rare epithelial cells. The culture showed scanty growth of *Streptococcus pneumoniae*, *Haemophilus influenzae* and normal vaginal flora. A urine culture was negative. Pelvic ultrasound and chest x-ray were normal. The patient was treated for suspected pelvic inflammatory disease (endometritis) and septic shock with broad spectrum antibiotics including: cloxacillin, tobramycin, metronidazole and doxycycline. She improved clinically in 48 h and was discharged home five days later on oral penicillin V.

Pneumococcus found in the patient’s cervix was also isolated from the blood. It proved to be *Streptococcus pneumoniae* type 1. *Strept pneumoniae* type 34 was isolated from a throat swab of the patient’s sexual partner, but *H influenzae* was not cultured.

**DISCUSSION**

This is the first reported case of pneumococcal endometritis with local peritonitis in a patient using tampons. Previously, cases of pneumococcal endometritis were usually diagnosed at laparotomy or on post mortem examination in patients suspected primarily of having peritonitis with or without salpingitis. Most of the patients had no primary site of infection, except for women in the post partum period. Consequently, the present literature review focuses on pneumococcal endometritis with coexisting peritonitis.

Pneumococcal peritonitis has been described in both immunocompetent and immunodeficient children and adults (Table 1). Primary pneumococcal peritonitis with no pre-existing site of infection was commonly described in young children, mainly in prepubertal girls prior to the antibiotic era, and was associated with a mortality approaching 100% (1,16,17). Others described this condition in otherwise healthy adolescent girls (3), children and adults with post necrotic cirrhosis and ascites (12,13), nephrotic syndrome (14), bone marrow transplant (15) and post splenectomy patients (12).

Pneumococcal peritonitis with endometritis affects young women in puerperium (4-7) and those with IUCDs (8-11). Pneumococcal infections associated with the perinatal period were often fatal in the pre-antibiotic era (Table 2). In the antibiotic era, they were described mainly in association with the use of IUCDs (Table 3).

The portal of entry for pneumococcus into the peritoneal cavity remains uncertain. Four routes of infection have been postulated: the genital tract; transdiaphragmatic lymphatics; the gastrointestinal tract; and the bloodstream. In primary pneumococcal peritonitis affecting prepubertal girls, ascending infection via the reproductive system was suggested. However, this mode of entry fails to explain the route of infection in male patients (16). Although the respiratory and gastrointestinal tract routes are favoured by some, the bloodstream seems to be the most common pathway of invasion in the majority of cases (1,10,16,17).

Local factors may enhance invasion of the endometrium by the organism. Pneumococci cannot survive the pH of the normal vagina, which ranges between 4.0 and 5.0. However, it has been observed that children and chronically ill and debilitated patients can have an alkaline vaginal pH which may contribute to spontaneous pneumococcal peritonitis in these groups (6).

Apart from local factors, general immunity also plays an important role in pneumococcal infections. Post splenectomy patients are at increased risk, as are patients with liver cirrhosis and ascites with complement and IgM deficiencies. It has been shown that such deficiencies may reduce the bactericidal and opsonic activity of ascitic fluid and serum (12).

---

**TABLE 1**

*Table of patients with pneumococcal peritonitis*

<table>
<thead>
<tr>
<th>Host defence status</th>
<th>Coexisting factors (number of cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immunocompetent</strong></td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>Prepubertal girls (28)</td>
</tr>
<tr>
<td>Adults</td>
<td>Healthy (1)</td>
</tr>
<tr>
<td></td>
<td>Post partum (13)</td>
</tr>
<tr>
<td></td>
<td>Intrauterine contraceptive device (6)</td>
</tr>
<tr>
<td><strong>Immunocompromised</strong></td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>Post necrotic cirrhosis and ascites (9)</td>
</tr>
<tr>
<td>Adults</td>
<td>Nephrotic syndrome (12)</td>
</tr>
<tr>
<td></td>
<td>Bone marrow transplant (15)</td>
</tr>
<tr>
<td></td>
<td>Post splenectomy (1)</td>
</tr>
</tbody>
</table>
Pneumococcal peritonitis and endometritis in association with intrauterine contraceptive devices (IUCD)

<table>
<thead>
<tr>
<th>Case</th>
<th>Author</th>
<th>Age (years)</th>
<th>IUCD duration</th>
<th>Clinical circumstances</th>
<th>Site of positive pneumococcal culture</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Herbert and Mortimer (8)</td>
<td>32</td>
<td>Lippes loop (2 years)</td>
<td>Peritonitis, bilateral salpingitis, recurrent endometritis</td>
<td>Peritoneal fluid, blood, vaginal discharge</td>
<td>Laparotomy, antibiotics, IUCD removal</td>
<td>Recovery</td>
</tr>
<tr>
<td>2</td>
<td>Gruer et al (9)</td>
<td>32</td>
<td>Gravivard (1.5 years)</td>
<td>Peritonitis</td>
<td>Blood</td>
<td>Laparotomy, antibiotics, IUCD removal</td>
<td>Recovery</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>46</td>
<td>Lippes loop (5.5 years)</td>
<td>Peritonitis, endometritis</td>
<td>Blood</td>
<td>Laparotomy, antibiotics, IUCD removal</td>
<td>Recovery</td>
</tr>
<tr>
<td>4</td>
<td>Ron-El et al (10)</td>
<td>46</td>
<td>Dalcon (4 years)</td>
<td>Peritonitis, salpingitis</td>
<td>Blood, peritoneal fluid</td>
<td>Laparotomy, antibiotics</td>
<td>Death</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>39</td>
<td>Lippes loop (2 years)</td>
<td>Peritonitis, salpingitis, pleural effusion</td>
<td>Peritoneal and pleural fluid</td>
<td>Laparotomy, left oophorectomy, hysterectomy, antibiotics</td>
<td>Recovery</td>
</tr>
<tr>
<td>6</td>
<td>Goldman et al (11)</td>
<td>38</td>
<td>Nova-T (3 months)</td>
<td>Peritonitis, salpingitis, endometritis</td>
<td>Blood, peritoneal fluid</td>
<td>Laparotomy, antibiotics, IUCD removal</td>
<td>Recovery</td>
</tr>
</tbody>
</table>

Strep pneumonae was isolated from the cervix and blood of the patient described in the present report. The organism could have entered the blood via either respiratory or genital routes. The coexistence of H influenzae in the cervical specimen might have supported the respiratory route, but the present patient had no symptoms of an upper respiratory tract infection, and a throat swab was not obtained. It is therefore much more likely that the genital route was the portal of entry. Disruption of the cervical mucosa by the tampon may have facilitated bloodstream invasion. Ascending infection probably led to peritonitis in this patient. Direct orogenital transmission of Strep pneumoniae by oral sex was also considered. Simultaneous isolation of H influenzae from the patient's cervical swab would support this. Against this, however, is the fact that the patient and her sexual partner had two different serotypes of pneumococcus. In addition, H influenzae was not recovered from the partner's throat swab.

The role of the vaginal tampon is not clear. Tampons have been associated with Staphylococcus aureus in toxic shock syndrome (18), and in fact, this syndrome was considered in the initial differential diagnosis. It has been hypothesized in
toxic shock syndrome that the tampon acts as a plug, allowing stasis or pooling of menstrual fluids, thus promoting multiplication of microorganisms (19). Other investigators have suggested that the physical and chemical constituents of tampons alter the growth environment by lowering magnesium ion content (20) and increasing pCO2 within the vagina (21). In addition, it has been demonstrated that the pH (6.9 to 7.2), glucose, protein and calcium content of menstrual blood may provide a sufficient medium for expression of the toxic shock syndrome toxin (22). These factors could enhance the growth of Strep pneumoniae, which requires a neutral pH and higher carbon dioxide concentrations. The presence of blood products in the genital tract may account for the association of pneumococcal endometritis and peritonitis with the post partum period. Finally, the tampon acting as a foreign body may have irritated the vaginal mucosa and facilitated the entry of organisms into the bloodstream.

An unusual case of pneumococcal endometritis with local peritonitis has been presented. To the authors’ knowledge this is the only case in the literature describing pneumococcal endometritis with peritonitis and bacteremia in association with tampon use. Although the pneumococcus was not transmitted by oral sex, one should be cognizant of this mode of transmission in cases of pelvic inflammatory disease. Current therapy recommendations for pelvic inflammatory diseases provide adequate coverage for Strep pneumoniae (23).

ACKNOWLEDGEMENTS: The authors thank Dr VC Huang at the National Streptococcus Reference Centre, Laboratory Centre for Disease Control, Ottawa, Ontario for typing the isolates of Streptococcus pneumoniae.

REFERENCES