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

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The first case of pneumococcal endometritis with peritonitis in a woman using tampons is described. The patient responded to removal of the tampon and administration of broad spectrum antibiotics. The pathogenesis of pneumococcal endometritis and peritonitis and the potential significance of a tampon in situ are discussed.

Key Words: Endometritis, IUCD, IUD, Peritonitis, Streptococcus pneumoniae, Tampons

Endométrite à pneumocoques et péritonite: Observation et recensement de la littérature

RESUME: On rapporte un cas d'endométrite à pneumocoques accompagné de péritonite chez une patiente utilisatrice de tampons hygiéniques. La patiente a réagi favorablement sous antibiothérapie à spectre large, et après que le tampon a été retiré. La pathogenèse de l'endométrite à pneumocoques et de la péritonite ainsi que l'importance éventuelle du tampon in situ sont examinées.

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-

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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 $14.6 \times 10^9/L$ 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 *Strep pneumoniae* type 1. *Strep 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 ap-

TABLE 1
Spectrum of patients with pneumococcal peritonitis

Host defence status	Coexisting factors (number of cases)
Immunocompetent	
Children	Prepubertal girls (28) Adolescent girls (1)
Adults	Healthy (1) Post partum (13) Intrauterine contraceptive device (6)
Immunocompromised	
Children	Post necrotic cirrhosis and ascites (9)
Adults	Nephrotic syndrome (12) Bone marrow transplant (1) Post splenectomy (1)

proaching 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 invasion 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 2
Post partum pneumococcal peritonitis with endometritis

Case	Author	Age (years)	Clinical circumstances	Site of positive pneumococcal culture	Treatment	Outcome
1	Nuckols et al (6)	24	Caesarean section, lobar pneumonia, septicemia, meningitis	Lung, blood, uterus, meninges, tricuspid valve, venous thrombi	None	Fatal
2		29	Vaginal delivery, lobar pneumonia, empyema, endometritis	Sputum, blood, placenta	Antiserum	Recovery
3		27	Vaginal delivery, lobar pneumonia, endometritis	Sputum, blood, endocervix	Antiserum	Recovery
4	Finland et al (4)	?	Forceps delivery, pneumonia, endometritis	Uterus, blood	None	Fatal
5		?	Vaginal delivery, pneumonia, endometritis	Lochia, blood	Antiserum	Recovery
6		?	Caesarean section, pneumonia, endometritis	Uterus, blood	None	Fatal
7		?	Caesarean section, pneumonia, endometritis	Lochia, blood	None	Recovery
8		?	Septic abortion, pneumonia, endometritis	Uterus, blood	None	Fatal
9		?	Induced abortion, peritonitis, pneumonia	Cervical swab, blood	None	Recovery
10		?	Induced abortion, peritonitis, pneumonia	Uterus, blood	None	Fatal
11		?	Induced abortion, peritonitis, pneumonia	Uterus, blood	None	Fatal
12	McCarthy et al (5)	18	Vaginal delivery, endometritis	Lochia	Antibiotics	Recovery
13	Hutchison et al (7)	27	Vaginal delivery, meningitis, endometritis	Uterus, vaginal swab, CSF, blood	Antibiotics	Fatal

CSF Cerebrospinal fluid

TABLE 3
Pneumococcal peritonitis and endometritis in association with intrauterine contraceptive devices (IUCD)

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

Strep pneumoniae 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 pCO_2 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 en-

dometritis 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).

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REFERENCES

1. McCartney JE, Fraser J. Pneumococcal peritonitis. *Br J Surg* 1922;9:479-89.
2. Friedland JA, Harris MH. Primary pneumococcal peritonitis in a young adult. *Am J Surg* 1970;119:737-9.
3. McFarlane AC, Hamra LK, Reiss-Levy E, Hansman D. Pneumococcal peritonitis in adolescent girls. *Med J Aust* 1979;1:100-1.
4. Finland M, Dubin TD. Pneumococcal pneumonias complicating pregnancy and the puerperium. *JAMA* 1939;112:1027-32.
5. McCarthy VP, Cho CT. Endometritis and neonatal sepsis due to *Streptococcus pneumoniae*. *Obstet Gynecol* 1979;53S(Suppl 3):47-9.
6. Nuckols HH, Hertig AT. Pneumococcus infection of the genital tract in women. *Am J Obstet Gynecol* 1938;35:782-3.
7. Hutchison CPT, Kenney A, Eykyn S. Maternal and neonatal death due to pneumococcal infections. *Obstet Gynecol* 1984;63:130-1.
8. Herbert TJ, Mortimer PP. Recurrent pneumococcal peritonitis associated with IUCD. *Br J Surg* 1974;61:901-2.
9. Gruer LD, Colingham KE, Edwards CW. Pneumococcal peritonitis associated with an IUCD. *Lancet* 1983;ii:667.
10. Ron-El R, Bukovsky I, Kharash J, Letko Y, Caspi E. Pneumococcal peritonitis with the presence of IUCD. *Int J Gynecol Obstet* 1985;23:339-41.
11. Goldman JA, Yeshaya A, Peleg D, Dekel A, Dicker D. Severe pneumococcal peritonitis complicating IUD: Case report and review of literature. *Obstet Gynecol Surv* 1986;41:672-4.
12. Epstein M, Calia FM, Gabuzda GJ. Pneumococcal peritonitis in patient with postnecrotic cirrhosis. *N Engl J Med* 1968;278:69-73.
13. Larcher VF, Manolaki N, Vegnente A, Vergani D, Mowat AP. Spontaneous bacterial peritonitis in children with chronic liver disease: Clinical features and etiologic factors. *J Pediatr* 1985;106:907-12.
14. Krensky AM, Ingelfinger JR, Grupe WE. Peritonitis in childhood nephrotic syndrome. *Am J Dis Child* 1982;136:732-6.
15. Julia A, Acebedo G, Jornet J, Zuazu J. Spontaneous pneumococcal peritonitis. Late infection after bone marrow transplant. *N Engl J Med* 1985;312:587.
16. Lipshutz B, Lowenburg H. Pneumococci and streptococci peritonitis. Report of 23 cases in infancy and childhood. *JAMA* 1926;86:99-106.
17. Cole WH. Pneumococcus peritonitis. *Surgery* 1937;1:386-95.
18. See RH, Chow AW. Microbiology of toxic shock syndrome: A review. *Rev Infect Dis* 1989;11 (Suppl 1):S55-8.
19. Clayton AJ, Peacocke JE, Ewan PE. Toxic shock syndrome in Canada. *Can Med Assoc J* 1982;126:776-9.
20. Mills JT, Parsonnet J, Tsai Y-C, Kendrick M, Hickman RK, Kass EH. Control of production of toxic shock syndrome toxin-1 (TSST-1) by magnesium ion. *J Infect Dis* 1985;151:1158-61.
21. Wagner G, Bohr Z, Wagner P, Peterson LN. Tampon-induced changes in vaginal oxygen and carbon dioxide tensions. *Am J Obstet Gynecol* 1984;148:147-50.
22. Todd JK, Todd BH, Franco-Buff A, Smith CM, Lawellin DW. Influence of focal growth conditions on the pathogenesis of toxic shock syndrome. *J Infect Dis* 1987;155:673-81.
23. Peterson HB, Galaid EI, Zenilman JM. Pelvic inflammatory diseases: Review of treatment options. *Rev Infect Dis* 1990;12(Suppl 3):S656-64.