Acute Terminal Ileitis Associated with Pneumococcal Bacteremia: Case Report and Review of Pneumococcal Gastrointestinal Diseases

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In this report, we describe a patient with acute terminal ileitis due to Streptococcus pneumoniae, review 3 previously reported cases of isolated enteritis due to S. pneumoniae, and summarize the English-language literature on primary and secondary pneumococcal gastrointestinal diseases. Various theories have been advanced to explain the pathogenesis of this rare and potentially life-threatening form of pneumococcal infection, but the mechanism by which S. pneumoniae causes gastrointestinal disease is still unknown.

Cases of primary Streptococcus pneumoniae infection of the gastrointestinal tract have been published in the 20th century, but these cases and subsequent sporadic reports of the same disease entity have received little attention in recent reviews [1] and are not quoted in current texts [2–4]. In this report, we describe a previously healthy young woman who was hospitalized with acute right lower abdominal pain mimicking appendicitis. S. pneumoniae was isolated from a blood culture, and an exploratory laparotomy revealed acute terminal ileitis.

Case report. A previously healthy 33-year-old woman presented to the Durham Regional Hospital (Durham, NC) emergency department 8 h after experiencing the sudden onset of diffuse abdominal pain in the right lower quadrant in association with fever, chills, and nausea. Her pain became generalized, constant, and severe. Immediately before admission, the patient had passed several watery stools and vomited. She had no headache and no respiratory or genitourinary complaints. The only medication that the patient had taken before admission was norethindrone, to control menstrual bleeding. Most recent sexual intercourse had occurred 3 days before the onset of symptoms, and most recent menses occurred 2 months earlier. The patient smoked occasionally and drank small amounts of alcohol.

At the time of admission, the patient was in severe discomfort and was febrile (temperature, 38.4°C), hypotensive, and tachycardic. Her heart and lungs appeared normal on examination. Abdominal examination revealed diffuse guarding and rebound tenderness with hypoactive bowel sounds. Obturator and psoas signs were negative. Cervical motion and palpation of the adnexae during pelvic examination caused moderate pain. The results of digital rectal examination were normal, and results of a test for fecal occult blood were negative. Her WBC count was 9400 cells/mm³, with 65% polymorphonuclear leukocytes, 26% band forms, and 7% lymphocytes. Results of other laboratory tests, including hemocrit, platelet count, urinalysis, and measurement of serum electrolytes, creatinine, liver enzymes, amylase, and β-human chorionic gonadotropin levels, were normal. Results of a stool examination for fecal leukocytes were negative. An abdominal radiograph revealed mild dilatation of a single loop of the small bowel and changes compatible with an ileus. After blood, urine, cervical mucus, and stool samples were obtained for culture, intravenous antimicrobial therapy was initiated. Abdominal and pelvic CT revealed thickening of the cecal wall; the appendix was poorly visualized (figure 1). An exploratory laparotomy was performed to confirm a presumed diagnosis of appendicitis. The terminal ileum was diffusely swollen and hyperemic, but the rest of the small and large bowel appeared to be normal (figure 2). The serosal surface of the ileum was smooth, and, therefore, a biopsy was not performed. The uterus, ovaries, and fallopian tubes were normal. Twelve hours after surgery, the patient reported less abdominal pain; within 36 h, she was able to eat and walk with minimal pain or discomfort.

Culture of a stool sample was negative for Campylobacter, Salmonella, Shigella, Vibrio, and Yersinia organisms, and a culture of cervical mucus was negative for the presence of Neisseria gonorrhoeae. Intraoperative cultures of peritoneal fluid and appendiceal tissue were also negative. A penicillin-susceptible strain of S. pneumoniae was isolated from 2 blood samples collected at the time of admission. No abnormalities were seen on chest radiographs obtained at the time of admission and 48 h later. The patient was discharged 72 h after admission; when she was contacted 5 months after discharge, she stated that she...
was well. She declined to have throat, vaginal, and stool cultures for *S. pneumoniae* done after discharge.

**Discussion.** Most current textbooks do not mention the fact that *S. pneumoniae* may cause abdominal infection, even though a small number of case reports have described primary pneumococcal peritonitis, enteritis, and appendicitis [5–18]. Other authors have described cases of secondary, nonspecific gastrointestinal manifestations, such as nausea, vomiting, and diarrhea, in association with bacteremic and nonbacteremic pneumococcal infection [19–22]. Many of these reports were published as letters or brief reports in surgical, pediatric, and general medicine journals, and, to our knowledge, no author has systematically reviewed these reports.

We believe that our patient had enteritis due to *S. pneumoniae*, for the following reasons: (1) pneumococcal bacteremia was documented, and no source other than the patient’s gastrointestinal tract was apparent; (2) findings on laparotomy confirmed the presence of enteritis; and (3) gastrointestinal symptoms resolved promptly after the initiation of antibiotic therapy. In our review of the literature, we were able to find only 3 other cases of primary pneumococcal enteritis [6–8]. One case involved a 29-year-old man with clinical symptoms typical of appendicitis. On exploratory laparotomy, only an inflamed cecum was found, and a swab of the cecal wall yielded pneumococci [8]. In another case, a 4-year-old girl with complaints of profuse, watery diarrhea, headache, and anorexia had pneumococcal enteritis that was confirmed by stool cultures containing numerous pneumococci [6]. In a third case, a 3.5-year-old girl developed watery, bloody stools, epigastric pain, and rectal prolapse. Colonoscopy revealed acute colitis, and stool cultures were positive for *S. pneumoniae* [7]. Surprisingly, in the latter 2 cases, blood cultures were negative for *S. pneumoniae*.

Primary pneumococcal appendicitis also has been described [12]. In 1984, Heltburg et al. [15] reported 6 cases of primary pneumococcal appendicitis, but only 4 other cases have been described since then. In one case series of acute appendicitis, *S. pneumoniae* was isolated from 2 of 43 intraoperative cultures of appendicular pus; in both cases, *S. pneumoniae* was found in association with *Bacteroides fragilis*, *Escherichia coli*, or both [16]. In another report, a 28-year-old man with hemophilia A and HIV infection was found to have a gangrenous appendix on laparotomy, and cultures of appendiceal tissue yielded a pure growth of *S. pneumoniae* [12]. In the fourth case, cultures of appendiceal tissue from a 4-year-old boy with typical symptoms of appendicitis were positive for both *S. pneumonia* and *Haemophilus influenzae* [17].

Peritonitis is the most common pneumococcal infection of the abdomen. The majority of cases of pneumococcal peritonitis occur in children or in adults with nephrotic syndrome or cirrhosis [1]. Fowler [5] reviewed 50 cases of pneumococcal peritonitis in children that occurred from 1925–1955, but he was able to identify only 6 cases during the period 1955–1970. In a recent report, Hemsley et al. [18] described 27 cases of primary pneumococcal peritonitis in healthy adults. Tariq and Joseph [23] described an immunocompetent woman with primary pneumococcal peritonitis and bacteremia who presented with severe watery diarrhea (25 episodes daily), vomiting, and abdominal pain.

Patients with isolated pneumococcal bacteremia or pneumonia not associated with sinusitis, meningitis, or peritonitis may have nonspecific abdominal symptoms, such as nausea, vomiting, diarrhea, or abdominal pain [19–22, 24]. Although clinicians have observed these clinical symptoms, few published reports have focused on these nonspecific abdominal complaints. Cope [25] emphasized this fact in his classic monograph on the acute abdomen. Sir William Osler [19] used the term “croupous colitis” to describe bowel pathology in 5 patients who had died of pneumococcal bacteremia. Guerin et al. [21] reported that 7 (8%) of 86 patients with pneumococcal bacteremia had severe watery diarrhea. Spitalny et al. [24] described 3 patients with pneumococcal bacteremia who experienced nausea, vomiting, diarrhea, or abdominal pain. In another case report, 4 children presented with acute abdominal mimicking appendicitis but were subsequently found to have pneumococcal pneumonia [26]. It is unclear whether these patients had concomitant primary gastrointestinal illness or whether the nonspecific gastrointestinal tract symptoms were part of the clinical syndrome of pneumococcal infection. The actual frequency of gastrointestinal symptoms in patients with pneumococcal bacteremia or pneumonia is impossible to ascertain, because this clinical feature has not been the focus of many investigators’ reviews.

The mechanism by which *S. pneumoniae* causes gastrointestin-
tinal disease is unknown. Various theories have been proposed [5, 10, 18, 20]. These theories include direct infection of the gut wall via hematogenous seeding or via mucosal translocation leading to direct invasion of the bowel wall. Other authors have speculated that enterotoxin-producing strains of S. pneumoniae may stimulate a secretory diarrhea [20]. Finally, S. pneumoniae in the female genital tract may occasionally ascend through the fallopian tubes and cause inflammation in the peritoneum or bowel wall.

For pneumococcal gastrointestinal infection to occur through a hematogenous route is probably rare, relative to the disparity between the incidence of pneumococcal bacteremia and the infrequent recognition of pneumococcal enteritis, appendicitis, and peritonitis. Oropharyngeal carriage of S. pneumoniae is common, but, to our knowledge, no clear data are available that establish the sporadic presence of pneumococcus in gut flora and its subsequent ability to invade the bowel wall. Even if it is present, pneumococcus now is rarely isolated from routine bacterial stool cultures because of the use of inhibitory culture media, and, hence, its prevalence as a colonic colonizer is unknown. In addition, to our knowledge, there have been no published reports that describe strains of S. pneumoniae that produce enterotoxins. Because gastrointestinal symptoms often pre-date the typical signs and symptoms of bacteremia by hours or even a few days, it is possible that the primary locus of pneumococcal disease is indeed the gastrointestinal tract. The evidence for the hypothesis that the primary route of S. pneumoniae peritonitis is ascension from the female genitourinary tract also is circumstantial [11, 27]. McCartney [11] reported that 44 of 56 cases of pneumococcal peritonitis that he studied occurred in girls; thus, he concluded that primary pneumococcal peritonitis began as “pelvic peritonitis.” In fact, the non-specific symptoms of diarrhea, nausea, vomiting, and abdominal pain could be simply a nonspecific manifestation of pneumococcal sepsis. To systematically investigate any of these hypotheses, a prospective study in which stool and vaginal cultures were collected from all patients from whom pneumococci were isolated would be necessary. Our patient would not permit the collection of additional specimens for cultures that would allow us to determine whether she had persistent throat, vaginal, or bowel colonization with pneumococcus.

Our case report and literature review illustrate that primary pneumococcal infection of the gastrointestinal tract may occur rarely. S. pneumoniae infection should be included in the differential diagnosis for patients who present with acute abdominal symptoms. When patients with signs and symptoms of an acute abdomen are found to have pneumococcal bacteremia, clinicians should be aware that the positive blood culture results and gastrointestinal signs and symptoms may be linked and that antibiotic therapy may be curative. When such cases are encountered, we suggest that blood, throat, vaginal, and stool cultures be performed to better define the pathophysiologic characteristics of this disease.

**Addendum.** After this article was submitted, we discovered a new report on intra-abdominal infection due to S. pneumoniae [28]. The authors reviewed cases of primary peritonitis that have been reported since 1950, and they believe, on the basis of the clinical material presented, that primary peritonitis that occurs in women in the absence of underlying disease results from an upper genital tract infection with pneumococcus.

**References**


