

# Primary Bacterial Peritonitis Caused by *Streptococcus pneumoniae*

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## Abstract

Primary peritonitis is a rare infection in healthy children, mainly affecting patients with underlying medical disorders. We report a case of primary pneumococcal peritonitis in an immunocompetent 3-year-old boy. Diagnosis was made at laparotomy and cultures of the intra-abdominal pus yielded *Streptococcus pneumoniae*. Timely antibiotic treatment administered resulted in complete resolution of the infection.

**Keywords:** Antimicrobial treatment, children, diagnosis, primary peritonitis, *Streptococcus pneumoniae*

## INTRODUCTION

Primary or spontaneous peritonitis is defined as an infection of the peritoneal cavity without an evident intra-abdominal source.<sup>[1]</sup> In the pre-antibiotic era primary peritonitis accounted for 10% of all abdominal emergencies in children, but then with the advent of antibiotics, its incidence decreased to 1%–2%. Spontaneous pneumococcal peritonitis in children has been recognized for more than a century.<sup>[2]</sup> It occurs at any age, but its peak incidence is between 4 and 9 years of age, and it is more common in girls than boys (ratio, 4:1).<sup>[1]</sup> In the present article, we describe a case of primary pneumococcal peritonitis in a previously healthy boy, and we review the literature on this infection.

## CASE REPORT

A 3-year-old boy was brought to the emergency department because of a 48-h history of abdominal pain, nausea, anorexia, and fever. His medical history was unremarkable.

On admission, his pulse rate was 135 bpm, temperature was 38°C, and blood pressure was 101/81 mmHg. The physical examination of the abdomen revealed diffuse tenderness, rebound tenderness, guarding, and diminished bowel sounds. Abdominal ultrasonography detected increased amounts of peritoneal fluid. Chest auscultation did not reveal any pathologic signs and chest radiography was normal. In addition, no focal sites of infection on the ear, nose, and throat were detected.

Laboratory results showed an elevated peripheral white blood cell (WBC) count of 12,200/mm<sup>3</sup> (neutrophils 75%), and a C-reactive protein elevated at 4.5 mg/dL (normal values, 0.08–0.8 mg/dL). Other laboratory analyses comprised a negative HIV and HCV testing, liver function tests, renal function tests, and immunologic investigations were within the normal limits. Urinalysis showed acid pH of 5.5 and specific gravity of 1026, without leukocytes, erythrocytes, crystals, or casts. Blood and urine cultures taken on admission yielded no bacterial growth.

Due to the provisional diagnosis of acute appendicitis, antimicrobial treatment was empirically initiated with intravenous cefotaxime 300 mg every 6 h, amikacin 100 mg every 8 h, and metronidazole 200 mg every 8 h, and within a few hours from admission, an exploratory laparotomy was performed.

Intraoperatively, purulent secretions were found in the abdominal cavity, but no obvious intraperitoneal lesion could be identified. The appendix, which appeared macroscopically normal, was removed and sent for histologic examination. Histology demonstrated mild inflammatory alterations.

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**How to cite this article:** Maraki S, Moraitis P, Barbagadakis S, Vlachakis I. Primary bacterial peritonitis caused by *Streptococcus pneumoniae*. *J Global Infect Dis* 2021;13:103-4.

**Received:** 10 June 2020 **Revised:** 26 December 2020

**Accepted:** 04 January 2021 **Published:** 16 April 2021

### Access this article online

Quick Response Code:



Website:  
www.jgid.org

DOI:  
10.4103/jgid.jgid\_197\_20

Gram-stained smears of the purulent exudate demonstrated Gram-positive diplococci, and culture yielded *Streptococcus pneumoniae* (serotype 11A), which was intermediately susceptible to penicillin, but susceptible to third-generation cephalosporins (cefotaxime and ceftriaxone), macrolides, quinolones, tetracyclines, tigecycline, linezolid, and glycopeptides. The child was fully immunized against *S. pneumoniae* with the 13-valent pneumococcal conjugate vaccine (PCV13). Based on the results of the antimicrobial susceptibility testing of the isolate, metronidazole and amikacin were discontinued. Cefotaxime treatment was continued for a total of 10 days. Over the following days, the patient's condition was improved. The peripheral WBC count gradually decreased to 7700/mm<sup>3</sup> (neutrophils 40.9%), and C-reactive protein at 0.35 mg/dL.

The patient was discharged cured on the 11<sup>th</sup> postoperative day.

## DISCUSSION

This is a diagnosed case of primary pneumococcal peritonitis in a 3-year-old patient with typical symptoms of acute abdomen inflammation. The route of entry of pneumococci is usually not apparent, and often it is presumed to be hematogenous spread frequently from the respiratory tract, lymphogenous through transdiaphragmatic lymphatics, or translocation through an intact intestinal wall from the gut lumen. In females, the microorganisms may ascend from the vagina via the fallopian tubes.<sup>[1]</sup>

Primary peritonitis has been reported not only in children with postnecrotic cirrhosis, nephrotic syndrome and systemic lupus erythematosus but also affects otherwise healthy children without underlying predisposing conditions, as in our case.<sup>[1,3]</sup>

Several decades ago *S. pneumoniae* and Group A streptococci were the organisms most commonly reported to cause primary peritonitis. Fowler reported 50 cases of pneumococcal primary peritonitis from 1925 to 1955 and only 6 cases from 1956 to 1970.<sup>[4]</sup>

In a 5-year study from 2000 to 2004 in Alberta, Canada, among 1768 cases of invasive pneumococcal disease (IPD) in both adults and children, only 23 (1.3%) cases of peritonitis due to *S. pneumoniae* were found. Of these, only 4 involved children, 2 of which had a history of nephrotic syndrome, 1 suffered from hepatitis C and bladder rupture, and only 1 was a previously healthy 2-year-old girl.<sup>[5]</sup>

Although pneumococcal peritonitis declined by the end of the 20<sup>th</sup> century, an increased incidence of the disease was reported in Latin America, before the introduction of the conjugate pneumococcal vaccines in childhood. In Chile, among 491 IPD cases diagnosed in children, 116 (23.6%) were peritonitis, with a clear predominance of female patients (91 girls, 78.4%). Among them, only 6 girls had a predisposing medical condition, whereas 10 out of 25 male patients with peritonitis also suffered from nephrotic syndrome.<sup>[6]</sup> In Costa Rica among 132 children with IPD, 7.4% had peritonitis.<sup>[7]</sup>

The last decade, three children, two boys and one girl, were diagnosed with primary pneumococcal peritonitis in our institution. All three children had no underlying predisposing conditions.<sup>[8,9]</sup>

*S. pneumoniae* isolated from our patient belonged to serotype 11A, one of the most prevalent serotypes in our area after the introduction of the 13-valent pneumococcal conjugate vaccine (PCV 13).<sup>[10]</sup>

Concluding, primary pneumococcal peritonitis should be included in the differential diagnosis of acute abdomen in children. Gram-stain and culture of intra-abdominal material, collected during surgery or by abdominal puncture, are the keys to diagnosis and treatment.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the Guardian has given his consent for his son's and other clinical information to be reported in the journal. The guardian understands that no names and initials will be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Research quality and ethics statement:

The authors followed applicable EQUATOR Network (<http://www.equator-network.org/>) guidelines, notably the CARE guideline, during the conduct of this report.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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