

Primary Group A Streptococcal Peritonitis in a Previously Healthy Female Teenage Patient

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What do we already know about this topic?

While primary GAS peritonitis remains a rare cause of an acute abdomen in children, reports suggest a trend toward increased incidence.

How does your research contribute to the field?

Our report highlights a case of primary GAS peritonitis complicated by co-infection with *C. difficile* colitis, that required multiple drain placements and a prolonged antibiotic course.

What are your research's implication towards theory, practice, or policy?

The case suggests that forgoing extensive surgical washout of the abdominal cavity may contribute to adverse outcomes.

Case Report

A 14-year-old previously healthy female presented to another hospital with 5 days of nausea, emesis, diarrhea, and abdominal pain. Her most recent menstrual period was 10 days prior to presentation, and she denied sexual activity or retained tampon. Recent travel was limited to surrounding Midwestern states, and she denied exposures to animals and sick contacts. Initial laboratory testing revealed hyponatremia (131 mmol/L), hypokalemia (3.2 mmol/L), and hypoalbuminemia (2.7 g/dL) consistent with gastrointestinal losses, as well as leukocytosis (27.9 thous) with a significant bandemia (74% segmented neutrophils and 15% bands). Urinalysis demonstrated proteinuria (100 mg/dL) but was not suggestive of infection. Contrast-enhanced computed tomography (CT) abdomen showed acute diffuse gastroenterocolitis with moderate loculated ascites and small bilateral pleural effusions. Shortly following admission, the patient developed tachypnea and tachycardia. Due to the concern for sepsis in the setting of acute respiratory distress, she was transferred to the pediatric intensive care unit at our tertiary care center and broad-spectrum antibiotic therapy with piperacillin-tazobactam was initiated. Physical examination revealed an alert and fully oriented patient in mild distress with a temperature of

37.3°C, pulse of 153 beats/min, respiratory rate of 63 breaths/min and blood pressure of 118/90 mmHg. Breath sounds were diminished in the lower lobes bilaterally. Her abdomen was full and diffusely tender. Bowel sounds were not appreciated. The patient initially required high-flow oxygen therapy, but her respiratory status quickly improved. She was weaned to low-flow oxygen and transferred to the medical unit on hospital day #2.

Despite improvement in her respiratory status, she developed intermittent fever, peripheral edema, increasing abdominal distension, and persistent diarrhea. Repeat laboratory testing revealed worsening leukocytosis (36.3 thous), elevated acute phase reactants (C-reactive protein >27 mg/dL), and decreased complement levels (C3 69 mg/dL, C4 10 mg/dL). Blood cultures drawn on admission remained negative, but stool was positive for *Clostridium difficile* based on PCR testing. With this result, she was started on intravenous (IV) metronidazole and oral vancomycin therapy for severe *C. difficile* colitis on hospital day #3. Additionally, piperacillin-tazobactam was switched to ceftriaxone to maintain similar spectrum of coverage. An abdominal ultrasound obtained on day #4 confirmed moderate ascites and small bilateral pleural effusions; paracentesis yielded 120 mL of purulent ascitic fluid. Gram stain of the peritoneal fluid showed many segmented white blood cells and moderate gram-positive cocci with culture yielding *Streptococcus pyogenes*. She was transitioned from ceftriaxone to IV penicillin G therapy for treatment of primary group A streptococcal peritonitis.

Due to recurrent fever and persistent abdominal pain, a repeat CT was performed on day #11 and revealed a

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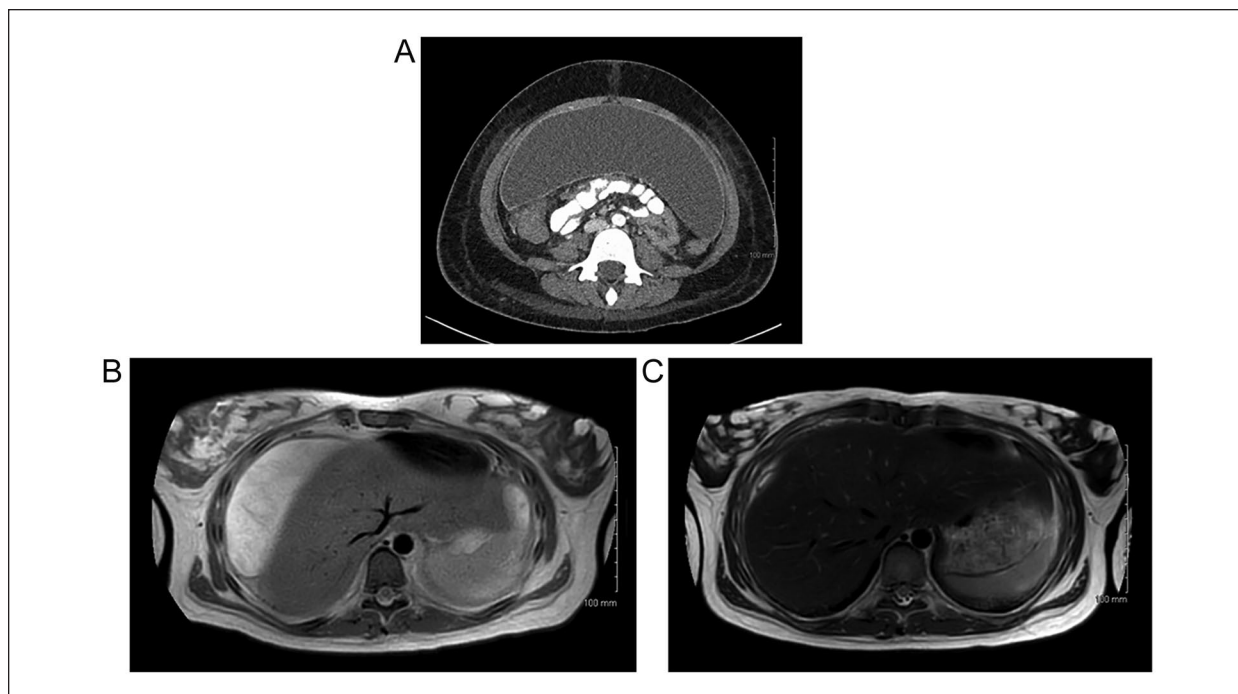


Figure 1. (A) Contrast-enhanced CT abdomen on day #11 showing large loculated fluid collection. (B) MRI abdomen without contrast at T2.Ax on day #19 with large right subphrenic and small left subphrenic abscess. (C) Final MRI abdomen without contrast at T2.Ax on day #61 showing near-complete abscess resolution.

very large, loculated peritoneal fluid collection in the anterior abdomen and pelvis, measuring $38 \times 6 \times 22$ cm (Figure 1A). One perihepatic drain and 1 left pelvic drain were placed by interventional radiology, removing 400 and 1600 mL, respectively. Cultures of the peritoneal fluid were negative. The perihepatic drain was removed after 3 days, while the left pelvic drain was removed after 6 days. IV metronidazole was discontinued on hospital day #12 following resolution of diarrhea. After 14 days of *C. difficile* colitis treatment, she was stepped down to once daily oral vancomycin as prophylaxis while on systemic antibiotics.

Magnetic resonance imaging (MRI) abdomen with and without IV contrast obtained on day #19 secondary to continued abdominal fullness demonstrated significant reduction of the fluid collections in the anterior abdomen and pelvis with residual large right and small left subphrenic fluid collections (Figure 1B). Drains were again placed in the right upper quadrant, left upper quadrant, and perisplenic space, collecting 315 mL combined. The next day, the perisplenic drain was removed. She was discharged on hospital day #22 with cephalexin and prophylactic oral vancomycin. The remaining drains were removed in the following week. Two weeks after discharge, the patient had a follow-up MRI showing persistent though decreased fluid collections. She remained on cephalexin and oral vancomycin. Her final MRI

obtained 1 month after discharge, revealed near-complete resolution of fluid collections (Figure 1C), and all antibiotics were discontinued after 61 days of total therapy.

Discussion

Bacterial peritonitis involves inflammation of the peritoneal lining of the abdominal cavity, and is usually defined as primary or secondary. Primary peritonitis refers to bacterial infection of the peritoneal cavity without a demonstrable intraabdominal source. Most cases occur in children with immune dysfunction or ascites resulting from cirrhosis and nephrotic syndrome. Secondary peritonitis, due to perforation of an intraabdominal viscus, occurs more frequently in the healthy pediatric population. The resulting peritonitis is predominately polymicrobial, while primary peritonitis is due to a single organism.¹

Streptococcus pneumoniae, gram-negative enteric bacilli, and *Staphylococcal* species are common pathogens implicated in primary peritonitis, while *Streptococcus pyogenes* is less prevalent. Group A *Streptococcus* (GAS) primarily causes upper respiratory tract and skin infections. Rarely, it causes gastrointestinal infection leading to an acute abdomen.¹ However, recent reports indicate a trend toward an increased incidence of primary GAS

Table 1. Demographics and Clinical Presentation of Pediatric Patients With GAS Peritonitis From 1999 to 2019.

Author	Year	Age	Sex	Presentation	Imaging	Cultures	Treatment	Terminal antibiotic
Watson and Powers¹⁴	1999	2 yo	F	Vomiting and diarrhea for 2 days; fever and irritable for 1 day	Barium enema: ileus; CT abdomen: ascites	Peritoneal, blood, and urine: GAS	Antibiotics for 14 days + immune globin + paracentesis	Ceftriaxone + clindamycin
Gillespie et al⁵	2002	3 yo	F	Fever, vomiting, diarrhea for 2 days with GAS positive pharyngeal cultures	Abdominal XR: ileus, thickened bowel walls	Peritoneal: GAS	Antibiotics for unknown duration + immune globin + laparotomy	Clindamycin
Liang et al⁶	2002	5 yo	F	Fever and pharyngitis for 2 days; diarrhea and abdominal pain for 1 day	Chest XR: elevated left hemidiaphragm; abdominal XR: ileus; abdominal US: ascites; chest XR: bilateral pleural effusion	Pleural: GAS Peritoneal: MRSA ^a	Antibiotics for unknown duration + laparotomy + drain placement	Vancomycin
Dann et al⁷	2005	8 yo	F	Fever, vomiting, diarrhea, abdominal pain for 10 hours	Initial CT abdomen: normal; abdominal XR: dilated small bowel; repeat CT abdomen: moderate free peritoneal fluid, dilated small bowel loops and peritoneal enhancement	Peritoneal: GAS	Antibiotics for unknown duration + laparotomy	Unknown
Sewrey and Bryant¹¹	2009	6 yo	F	Fever, vomiting, abdominal pain, pharyngitis, malaise for 3 days; positive rapid streptococcal antigen test	Initial CT abdomen and abdominal US: normal; repeat abdominal US: large amount of ascites with septations; repeat CT abdomen: complex ascites with peritoneal enhancement, thickened bowel walls	Peritoneal: GAS	Antibiotics for unknown duration + laparotomy	Unknown
Sewrey and Bryant¹¹	2009	7 mo	F	Vomiting, decreased feeding, lethargy for unknown duration	Abdominal XR: dilated duodenum, no signs of perforation	Peritoneal: GAS	Antibiotics for 10 days + laparotomy	Penicillin G
Demitrack¹²	2012	3 yo	F	Vomiting, diarrhea, abdominal pain for 12 hours; fever and cough for 1 week	Chest XR: hypoinflation, diffuse pulmonary infiltrates	Peritoneal and blood: GAS	Antibiotics for 14 days + laparotomy	Amoxicillin-clavulanate

(continued)

Table 1. (continued)

Author	Year	Age	Sex	Presentation	Imaging	Cultures	Treatment	Terminal antibiotic
Holden et al³	2012	14 yo	F	Fever, vomiting, diarrhea for 3 days; abdominal pain for 4 days	Abdominal US: free peritoneal fluid	Peritoneal and blood: GAS	Antibiotics for 20 days + immune globulin + laparotomy + drain placement	Amoxicillin
Patel et al⁸	2013	6 yo	F	Fever, vomiting, diarrhea, abdominal pain for 5 days	Chest XR: normal	Peritoneal: GAS	Antibiotics for unknown duration + laparotomy	Amoxicillin
Benidir and Lim⁴	2014	16 yo	F	Vomiting, diarrhea, abdominal pain for 4 days	Abdominal XR: dilated small bowel; abdominal US: free peritoneal fluid; CT abdomen: suggestive of small bowel obstruction	Peritoneal and blood: GAS	Antibiotics for unknown duration + laparotomy	Doxycycline + metronidazole
Filan and Abbas¹³	2014	7 yo	M	Fever, vomiting, diarrhea, abdominal pain for 6 days; peri-oral impetigo 3 weeks prior to presentation	Abdominal US: free peritoneal fluid, 2 areas suggestive of abscess; CT abdomen: free peritoneal fluid, inflammatory mass, 2 abscesses	Peritoneal: GAS	Antibiotics for 21 days + laparotomy	Clindamycin
Chomton et al¹⁰	2017	10 yo	F	Fever, pharyngitis, vomiting, diarrhea, abdominal pain for 3 days	Abdominal US: free peritoneal fluid	Peritoneal: GAS	Antibiotics for 14 days + laparotomy	Amoxicillin
Sharp et al²	2019	11 yo	F	Vomiting, fever, abdominal pain for 1 day; streptococcal pharyngitis 10 days prior	CT abdomen: mildly dilated appendix, peritoneal fluid collection	Peritoneal: GAS	Antibiotics for 10 days + laparotomy	Amoxicillin-clavulanate

³Peritoneal fluid obtained following initiation of antibiotic therapy; MRSA presumed to be secondary infection.

peritonitis.² The pathogenesis of primary GAS peritonitis remains unclear, although various theories have been proposed. Principal theories include hematogenous spread from the respiratory tract or skin, ascending infection in the female genital tract, and translocation from gastrointestinal tract and intact bowel.^{3,4} Review of pediatric literature reveals 13 reported cases of primary GAS peritonitis over the past decade. While several cases of primary GAS peritonitis have correlated with recent pharyngitis, our patient did not have these associated symptoms.⁵⁻⁸ Females are disproportionately affected, which suggests ascension from the female genital tract as a predominant source of infection. Case reports describe post-pubertal females developing primary GAS peritonitis following sexual intercourse or gynecologic exam.⁹ However, our patient denied sexual activity and has no history of gynecologic exam. Pharyngeal and vaginal cultures are often negative, thus a source of infection is not always identified.^{3,10}

Children present with onset of acute abdominal pain, fever, vomiting, and diarrhea. Clinical presentation often mimics acute appendicitis, a more common cause of acute abdomen in children. Laboratory values may show leukocytosis and elevated acute phase reactants. Initial imaging may be normal or nonspecific, supporting the necessity of repeat imaging.^{7,8} Review of the pediatric literature reveals treatment consists of laparotomy to establish the diagnosis and treatment, with surgical exploration of the abdominal cavity and extensive washout.^{2-8,10-13} In contrast, our patient did not undergo exploratory laparotomy. However, she developed large loculated abscesses, requiring placement of multiple drains during her treatment course. Only 2 previous pediatric cases describe drain placement, both with insertion intraoperatively.^{3,6} In the literature, the duration of antibiotics ranges from 10 to 21 days (Table 1).^{2,3,10-14} Our patient required 61 days of antibiotic therapy, suggesting that laparotomy may decrease length of illness. Although penicillin G remains first-line for treatment and prevention of GAS infection, various antibiotics have been employed (Table 1).^{2-8,10-14} In this case, penicillin G was selected for inpatient treatment of peritonitis, while cephalexin was utilized as an oral alternative for outpatient antibiotic therapy due to ease of dosing.

Conclusion

In summary, we describe a previously healthy 14-year-old female who presented with primary GAS peritonitis. Diagnosis was established via paracentesis rather than exploratory laparotomy. Multiple drain placements were required along with an extended antibiotic duration, highlighting the need for adequate source control. The

course of illness was complicated by co-infection with *C. difficile* colitis, requiring treatment and prophylaxis for the total antibiotic duration.

Author Contributions

Conceptualization, formal analysis, interpretation, all authors; writing - original draft preparation, H.H.; writing - revision, all authors.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval and Informed Consent


Written informed consent for the publication of patient information in the case report was obtained from the patient's guardians.

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