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Case report

Peritonitis caused by group A streptococcus: A case report and literature review

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ABSTRACT

Background: Group A streptococcus (GAS) occasionally causes life-threatening infections. We encountered a case of GAS peritonitis associated with bilateral salpingitis.

Case presentation: A 56-year-old previously healthy woman suddenly experienced a fever of 40 °C and lower abdominal pain, and was taken to the emergency room. She exhibited a condition of severe sepsis with pan-peritonitis. Although an intra-peritoneal source of infection was not detected preoperatively, an exploratory laparotomy was performed at 3 h after her arrival. During the surgery, bilateral salpingitis was observed. Peritoneal drainage was performed. Meropenem was administered and she was extubated on the next day. GAS was detected in the vaginal fluid culture and ascitic fluid culture. Antibiotics therapy was completed on post-operative day 9 and the patient was discharged on day 10 without any complications.

Methods: A literature review was performed using the following algorithm: "(group A streptococcus OR *streptococcus pyogenes*) AND (peritonitis)". All case reports and case series published in English after 1990 were reviewed.

Results: Fifty-six reports including 65 cases were eligible. There was a strong sex difference, with 80% of cases being female. All patients had symptoms of peritonitis, 80% had high-grade fever, and 74% had shock. The average time from onset to start of treatment was 3.8 days. Abdominal surgeries were required in 80% of cases. Multiple organ failure developed in 23%, and the mortality rate was 4.6%.

Discussion: GAS peritonitis is a rare but life-threatening disease. Emergency surgical exploration and drainage are required to prevent progression to multiple organ failure.

1. Background

Group A streptococcus (GAS) occasionally causes life-threatening infections such as necrotizing fasciitis and streptococcal toxic shock syndrome (STSS) associated with multiple organ failure (MOF). We report a case of peritonitis caused by GAS that rapidly progressed to severe sepsis [1] with a literature review. This case has been reported in line with SCARE criteria [2].

2. Case presentation

A 56-year-old previously healthy woman had abnormal vaginal discharge for 2 weeks. She visited a gynecologist and was examined by vaginal culture, cervical cytology, and endometrial cytology. On the next day, she suddenly experienced a fever of 40 °C and lower abdominal pain. She was taken to the emergency room (ER) after 10 h. Her blood pressure was 71/46 mmHg. The marked tenderness was observed from the right upper quadrant to the lower abdomen. Fluid resuscitation therapy of crystalloids 500 mL/h was administered. Blood test findings (Table 1) showed a remarkably high level of procalcitonin (75.49 ng/mL). An abdominal CT examination did not show free air or massive ascites, but full stomach and edema of the small intestine were observed (Fig. 1). An intra-peritoneal source of infection was not detected preoperatively, but the findings demonstrated a state of severe sepsis associated with severe pan-peritonitis. Therefore, an exploratory laparotomy was performed at 3 h after arrival. Surgical findings revealed purulent ascites filling the space around the abdominal cavity, but no injury in the gastrointestinal tract. The uterus was intact, but the ovaries and fallopian tubes on both sides were red and swollen. Thus, bilateral salpingitis was considered the cause of the peritonitis. It was decided to preserve the uterine adnexa, and perform peritoneal lavage and drainage. Although 4000 mL of crystalloid fluid was administered in the

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Table 1
Blood test findings for our case on arrival at the emergency room.

Blood test	Value
White blood cells (/μL)	17,600
Red blood cells (10^4/μL)	383
Hemoglobin (g/dL)	12.5
Hematocrit (%)	38.3
Platelets (10^4/μL)	17.4
Prothrombin time (%)	80
Activated partial thromboplastin time (s)	33.5
FDP-D dimer (μg/mL)	0.9
Sodium (mEq/L)	143
Potassium (mEq/L)	3.3
Urea nitrogen (mg/dL)	28
Creatinine (mg/dL)	1.63
Total bilirubin (mg/dL)	1.6
Albumin (g/dL)	4.0
AST (U/L)	21
ALT (U/L)	12
Lactate dehydrogenase (U/L)	200
Amylase (U/L)	126
C-reactive protein (mg/dL)	3.41
Procalcitonin (ng/mL)	75.49

AST: aspartate aminotransferase; ALT: alanine aminotransferase; FDP: fibrin degradation product.

first intraoperative hour of the 1 h and 27 min of surgery, there was a poor increase in blood pressure and the edema of the small intestine worsened. Therefore, the patient was intubated and managed postoperatively due to the concern of worsening respiratory status caused by the massive postoperative fluid infusion and subsequent diuretic phase.

The clinical course is shown in Fig. 2. Noradrenaline (NAD) was administered and intensive care with intubation management was started. Meropenem 1.5 g/day was administered. On day 2, she was extubated. NAD was tapered and finally terminated on day 3. Oral intake was started on day 4 and the drainage tube was removed. GAS was found in the vaginal fluid culture and ascitic fluid culture. Intravenous injection of antibiotics was stopped on day 6, but the body temperature rose to 38.1 °C; thus, oral levofloxacin was prescribed for an additional 3 days. The patient was discharged on postoperative day 10 without any complications. After 2 months, her condition was generally good and the infection did not recur.

3. Methods

Eligible studies were identified by searching PubMed (MEDLINE) up to 31 May 2021. The following algorithm was applied: "(group A streptococcus OR *streptococcus pyogenes*) AND (peritonitis)". All case reports and case series published in English after 1990 were reviewed.

4. Results

According to the PRISMA 2020 statement [3], 56 reports including 65 cases were found to be eligible (Fig. 3) [4–58]. As shown in Fig. 4, 11 to 13 reports have been published in each 5-year term since 2001, without obvious regional differences. The results are summarized in Table 2. The mean age of the patients was 33 years. There was a strong sex difference for the disease, with 52 (80%) cases being female. All patients had symptoms associated with peritonitis. High-grade fever (80%) and shock (74%) were also typical conditions. Rhabdomyolysis or necrotizing fasciitis was reported in 7 cases (11%). The average time from onset of illness to start of treatment was 3.8 days (range: 3 h to 24 days). Abdominal surgeries were required in 52 cases (80%), including a laparoscopic approach in 19 cases (29%). Ultrasound-guided puncture and drainage of ascites were performed in 4 cases (6.2%). MOF developed in 15 cases (23%), and mortality was reported in 3 cases (4.6%). Periods from initial treatment to death in the 3 cases were 0.5 days [5], 1 day [21], and 2 days [10].

GAS was detected in blood culture and/or ascitic fluid culture in all cases. GAS was also detected for other sites: cervicovaginal fluid in 10 cases (15%), throat or nose in 2 cases (3.1%), and appendix in 1 case (1.5%). Regarding the presumed etiology, secondary peritonitis was reported in 20 cases (31%) and divided into three conditions: pelvic inflammatory disease (PID) (9 cases; 14%), gastrointestinal diseases (9 cases; 14%), and peritoneal dialysis (PD)-related peritonitis (2 cases; 3.1%). PID included tubo-ovarian abscess or vaginal delivery. Gastrointestinal diseases included gastritis in 4 cases, appendicitis in 3 cases, ileitis in 1 case, and proctitis in 1 case. Among 45 cases (69%) diagnosed as primary peritonitis, GAS was detected in cervicovaginal fluid culture in 3 cases, skin culture in 2 cases, nose or throat culture in 2 cases, and histological examination of appendix in 1 case. Mortality occurred in 3 cases (4.6%), including 2 cases of primary peritonitis with unknown source and one case in the postpartum period.

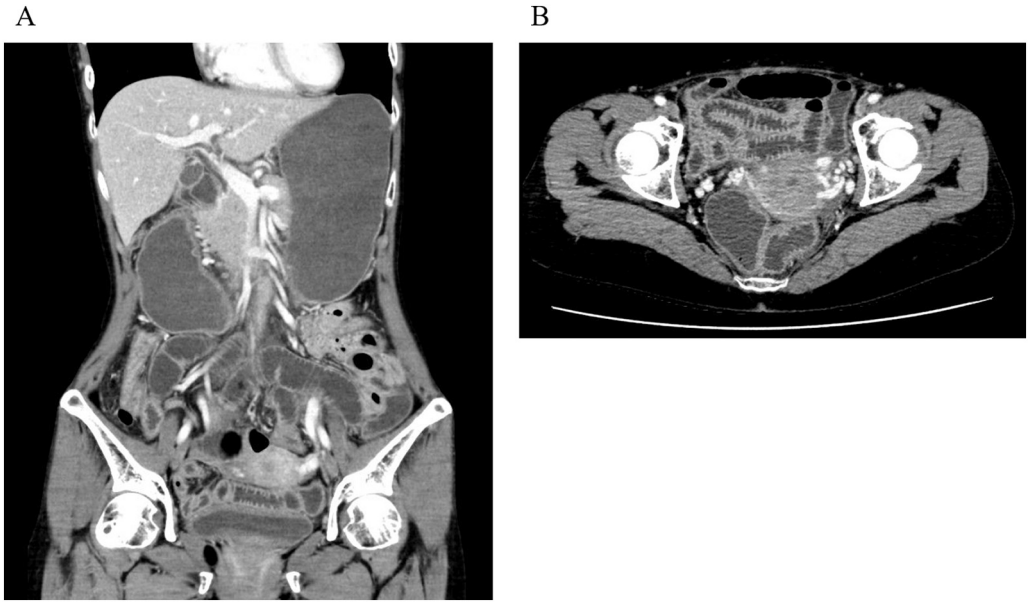

Fig. 1. Contrast-enhanced CT images at the first visit. A: Coronal section. B: Horizontal section.

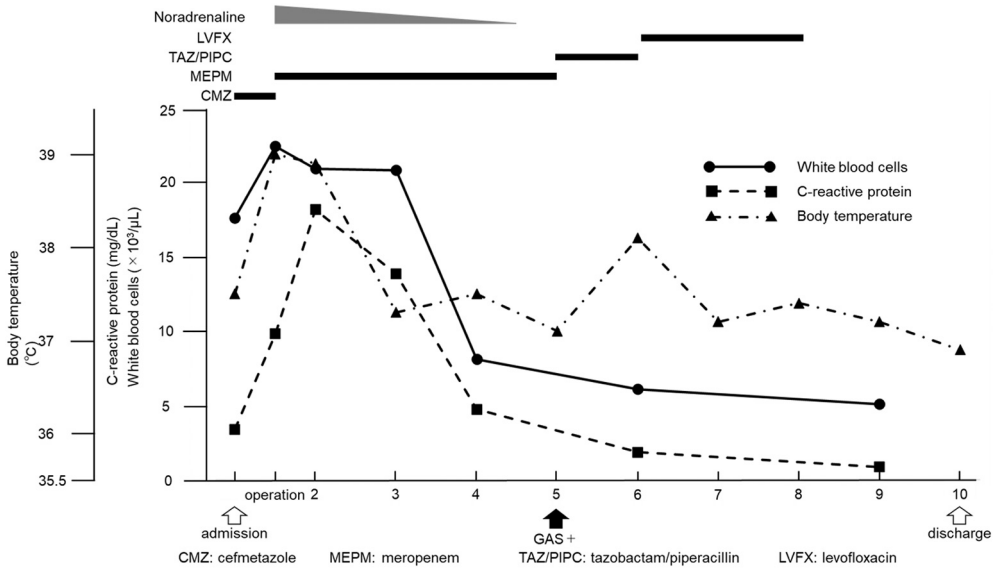

Fig. 2. Summary of the clinical and therapeutic course.

5. Discussion

We encountered a rare case of severe peritonitis caused by GAS. Emergency surgical exploration was indicated because the patient had signs of peritoneal irritation with severe sepsis, which implied sepsis arising from intraperitoneal infection [59]. A differential diagnosis was a perforation of small intestine or duodenum, so gynecologic examination was not examined preoperatively. However, in retrospect, there was a small amount of ascites around the right ovary. Based on her medical history, a gynecological infectious disease should have been suspected. During her clinical course, she never met the criteria for STSS defined by the Centers for Disease Control and Prevention (CDC) [60] in the absence of organ failure; progression of her symptoms was successfully prevented by the immediate surgical drainage with antibiotics. Surgical findings suggested that acute salpingitis caused an ascending infection to the whole peritoneum. GAS was detected in vaginal fluid culture and ascitic fluid culture, and thus she was diagnosed with secondary peritonitis caused by GAS.

GAS is the most common cause of pharyngitis, but is also an occasional colonizer of the female genital tract [61]. A study of predominantly Caucasian pregnant women in New England revealed only 0.03% with vaginal GAS colonization [62], while a study in Australia on women in late pregnancy showed only 0.06% with vaginal GAS colonization [63]. A study in Nigeria identified only 1 patient with GAS colonization among 45 women with PID [19]. However, GAS is a well-known causative organism for postpartum endometritis [64] and nonpregnancy-associated GAS PID [29]. There is growing evidence that GAS can be sexually transmitted [52]. These observations suggest that ascending infection from the vagina is the leading pathogenesis for GAS peritonitis in women [29]. Gastrointestinal disease is another leading pathogenesis for GAS peritonitis, although GAS is not part of the normal bowel flora [65]. Nevertheless, primary peritonitis spread from a distant organ, most commonly the upper respiratory tract, or from skin trauma.

The rates of MOF development and mortality for GAS peritonitis in our literature review were 23% and 4.6%, respectively. A case series of 62 ICU patients with GAS infections revealed that acute respiratory distress syndrome developed in 34%, acute kidney injury in 55% (with renal replacement therapy required in 21%), hepatic dysfunction in 64%, and coagulopathy in 69% [66]. A multinational epidemiological survey (Strep-EURO) in Europe in 2003 and 2004 reported that the 7-day mortality of severe GAS sepsis was 19% [67]. Development of STSS and necrotizing fasciitis were strongly associated with high mortality rates (7-day mortality rates of 44% and 32%, respectively) [67]. The importance of drainage to reduce the bacterial load has been underlined in STSS [68]. Because delayed drainage in GAS infections is associated with a risk for MOF development within several hours, we recommend emergency surgical exploration and drainage for patients presenting with peritonitis and shock or septicemia, regardless of the etiology after resuscitation, as well as initiation of broad-spectrum antibiotics in the ER. A laparoscopic approach is considered a good indication for primary peritonitis [24,69]. Nevertheless, 2 cases of PD-associated GAS peritonitis did not require surgical drainage or removal of the PD catheter [40,56]. However, it should be noted that their clinical manifestations were relatively mild, and associated with pneumonia [40] or HIV infection [56]. Incidentally, the current guidelines from the International Society for Peritoneal Dialysis recommend PD catheter removal if patients have not shown definitive clinical improvement within 5 days [70]. Fortunately, GAS is likely to be covered by most empiric antimicrobial regimens, given its susceptibility to penicillin [71], although a case with reduced susceptibility to fluoroquinolones was reported [38]. The guidelines of the Infectious Diseases Society of America recommend penicillin plus clindamycin for GAS necrotizing fasciitis [72]. Administration of intravenous immunoglobulin (IVIG) therapy should be considered depending on the patients' condition. A multicenter prospective study showed that no administration of IVIG was a risk factor for 90-day mortality in necrotizing soft-tissue infections caused by GAS [73]. A meta-analysis further showed an effect of IVIG on reducing mortality from 33.7% to 15.7% in clindamycin-treated STSS [74].

6. Conclusions

In patients with GAS peritonitis and shock or septicemia, emergency surgical exploration and drainage are required to prevent progression to MOF.

Abbreviations

AST	aspartate aminotransferase
ALT	alanine aminotransferase
CDC	Centers for Disease Control and Prevention
ER	emergency room
FDP	fibrin degradation product
GAS	group A streptococcus

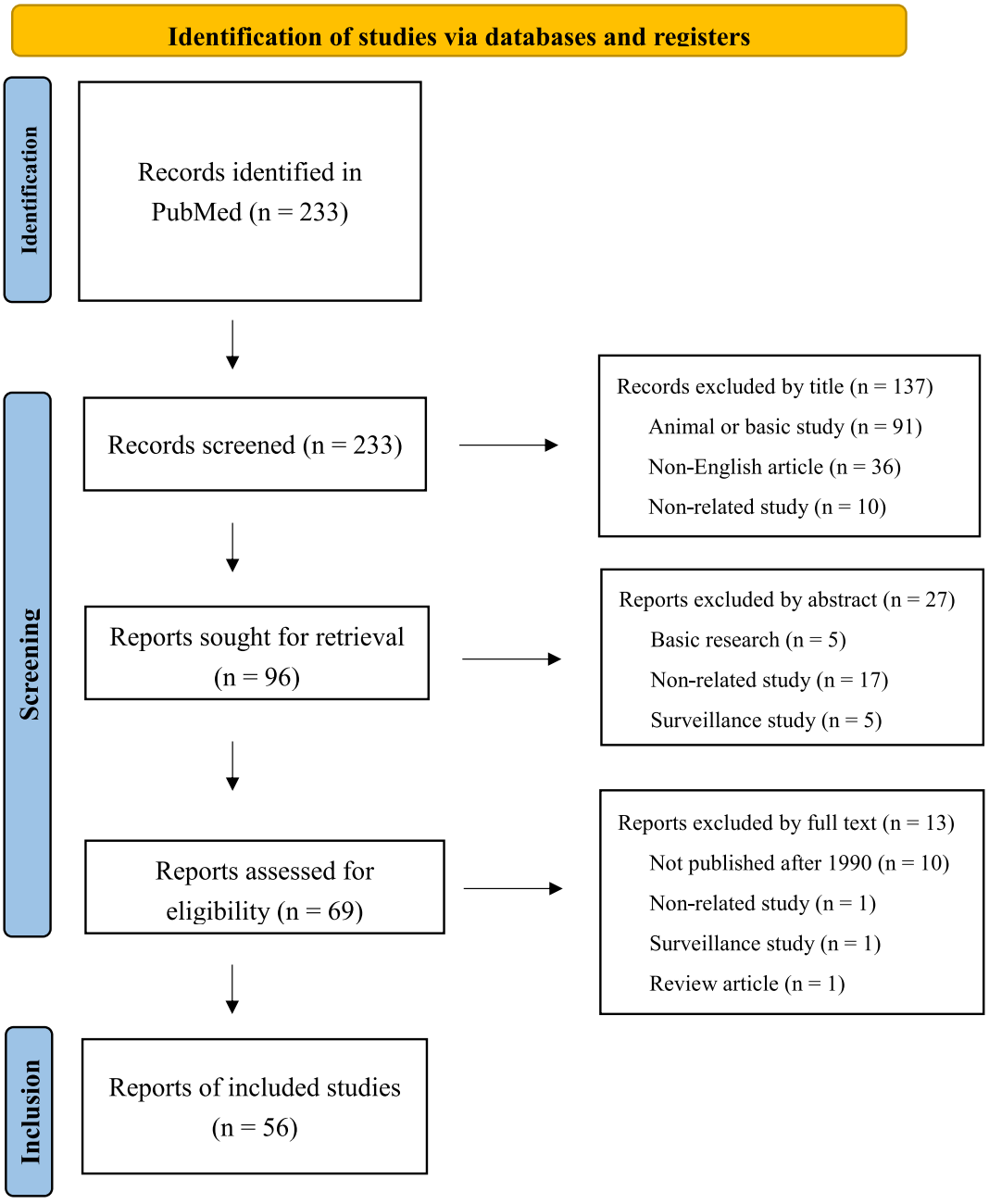

Fig. 3. Flow diagram of the literature review according to the PRISMA 2020 statement.

MOF multiple organ failure
NAD noradrenaline
PD peritoneal dialysis
STSS streptococcal toxic shock syndrome

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Ethical approval

The case report is exempt from ethical approval in our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

F.S. and T.S. contributed equally to conceptualizing the study, collecting data, and drafting the manuscript. K.Y. contributed to supervising the clinical situation, conceptualizing the study, and revising the manuscript. All authors approved the manuscript to be published.

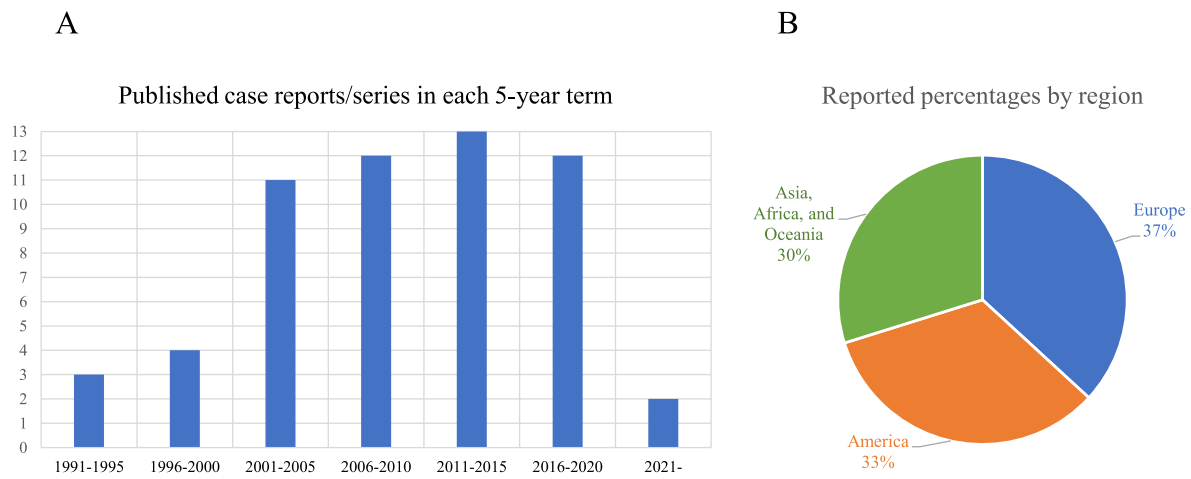

Fig. 4. A: Numbers of published case reports/series of GAS peritonitis. B: Reported percentages by region.

Table 2
Characteristics, clinical outcomes, and etiologies of GAS peritonitis.

Characteristics	
Age, median (range)	33 y (2 w to 82 y)
Sex	
Female, n (%)	52 (80)
Clinical outcomes	
Symptoms	
Fever, n (%)	52 (80)
Shock, n (%)	88 (74)
Period before treatment, median (range)	3.8 d (3 h to 24 d)
Abdominal surgery, n (%)	52 (80)
Multiple organ failure, n (%)	15 (23)
Mortality, n (%)	3 (4.6)
Etiology	
Primary peritonitis, n (%)	45 (69)
Secondary peritonitis, n (%)	20 (31)
Pelvic inflammatory diseases, n (%)	9 (14)
Gastrointestinal diseases, n (%)	9 (14)
PD-associated peritonitis, n (%)	2 (3.1)

PD: peritoneal dialysis.

Registration of research studies

Not applicable.

Guarantor

Fusao Sumiyama MD, Tatsuma Sakaguchi MD, PhD.

Declaration of competing interest

The authors declare that they have no competing interests.

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