Spontaneous bacterial peritonitis in adults: Clinical manifestations

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INTRODUCTION

Spontaneous bacterial peritonitis (SBP) is defined as an ascitic fluid infection without an evident intra-abdominal surgically-treatable source; it primarily occurs in patients with advanced cirrhosis [1,2]. Typically, it is suspected when patients present with signs or symptoms of SBP (eg, fever, abdominal pain). It may also be detected in patients who are asymptomatic who undergo paracentesis when admitted to the hospital for another reason. The diagnosis of SBP is established by a positive ascitic fluid bacterial culture, an elevated ascitic fluid absolute polymorphonuclear leukocyte (PMN) count (≥250 cells/mm^3), and exclusion of secondary causes of bacterial peritonitis.

An elevated ascitic fluid absolute PMN count (≥250 cells/mm^3) is adequate to make a presumptive diagnosis of SBP and to start empiric therapy. Too often, the paracentesis is performed after antibiotics are initiated and/or inadequate culture technique is used. In these situations, the cultures are regularly negative. (See "Spontaneous bacterial peritonitis in adults: Diagnosis".)

This topic will review the clinical manifestations of SBP. The pathogenesis of SBP, the diagnosis of SBP, differentiating SBP from a surgically-treatable cause of secondary bacterial peritonitis (eg, a perforated viscus), and the treatment and prophylaxis of SBP are discussed separately. (See "Pathogenesis of spontaneous bacterial peritonitis" and "Spontaneous bacterial peritonitis

in adults: Diagnosis" and "Spontaneous bacterial peritonitis variants" and "Spontaneous bacterial peritonitis in adults: Treatment and prophylaxis".)

IMPORTANCE OF EARLY RECOGNITION

It is important to recognize spontaneous bacterial peritonitis early in the course of infection because there is frequently a very short window of opportunity during which to intervene to ensure a good outcome. If the opportunity is missed, shock ensues, followed rapidly by multisystem organ failure [3]. Survival is unlikely in patients who develop shock prior to initiation of empiric antibiotics. One report estimated that survival decreased by approximately 8 percent for each hour of delay in starting antibiotics in patients with septic shock [4]. Another study has shown that delayed paracentesis in patients with SBP leads to a 2.7-fold increase risk of death; each hour of delay in paracentesis is associated with a 3.3 percent increase in in-hospital mortality [5]. (See "Spontaneous bacterial peritonitis in adults: Treatment and prophylaxis", section on 'Antibiotic therapy'.)

CLINICAL SETTING

Patients with spontaneous bacterial peritonitis (SBP) typically have advanced cirrhosis [1]. The higher the Model for End-stage Liver Disease (MELD) score, the higher the risk of SBP [6]. (See "Model for End-stage Liver Disease (MELD)".)

Spontaneous infection of noncirrhotic ascites (eg, ascites due to malignancy or heart failure) is unusual enough to be the subject of case reports and small series. (See "Pathogenesis of spontaneous bacterial peritonitis".)

Patients almost always develop SBP in the setting of large-volume, clinically-obvious ascites. SBP develops in preexisting ascites and is not a cause of ascites.

CLINICAL MANIFESTATIONS

Spontaneous bacterial peritonitis (SBP) should be suspected in patients with ascites due to advanced cirrhosis who develop symptoms such as fever, abdominal pain/tenderness, and altered mental status (table 1). Other signs and symptoms of SBP include diarrhea, paralytic ileus, hypotension, hypothermia, and laboratory abnormalities, such as a peripheral leukocytosis, metabolic acidosis, and azotemia. The signs and symptoms of SBP are subtle compared with those seen in patients with bacterial peritonitis in the absence of ascites. By

separating the visceral from the parietal peritoneal surfaces, ascites prevents the development of a rigid abdomen [7]. Approximately 13 percent of patients with SBP have no signs or symptoms of infection at the time of diagnosis [8].

With time, the number of patients diagnosed with SBP prior to developing symptoms has increased [9]. Patients with ascites routinely undergo paracentesis upon admission to the hospital or if any signs or symptoms of infection are present, leading to earlier detection of SBP (table 2).

In contrast, in the 1960s and 1970s, the index of suspicion of ascitic fluid infection was low, and the threshold for performing a paracentesis was high. As a result, infection was detected at an advanced stage in which shock was common and mortality was high [3].

Fever — Fever is the most common clinical manifestation of SBP. It is important to appreciate that patients with advanced cirrhosis are usually mildly hypothermic. Thus, a temperature of 37.8°C (100°F) or greater must be taken seriously, similar to the situation in the patient with neutropenia.

We give written instructions for patients to call our office if their temperature rises to this level. If the patient has a clear-cut viral syndrome, the problem may be handled over the telephone. Otherwise, evaluation in the clinic, urgent care, or emergency department is warranted. Paracentesis, urinalysis, complete blood count, and bacterial culture of ascitic fluid, urine, and blood are obtained. If the patient looks ill, hospitalization is required. (See "Spontaneous bacterial peritonitis in adults: Diagnosis".)

Abdominal pain and tenderness — Diffuse abdominal pain is the hallmark of peritonitis. However, the pain can be very subtle in SBP due to the presence of ascites, and some patients are asymptomatic. The pain is usually diffuse and continuous; it is different from the pain induced by stretching of the abdominal wall due to tense ascites.

As with abdominal pain, abdominal tenderness is a classic sign of peritonitis that can be subtle in SBP. These patients do not develop a rigid abdomen, although rebound tenderness may be present in advanced cases.

Altered mental status — The clinical sign of infection that is frequently overlooked in the patient with cirrhosis is a subtle change in mental status. While the patient may present with frank delirium, confusion, or cognitive slowing, the alteration in mental status may be so subtle that it can only be detected by a spouse or a clinician who knows the patient well. Altered mental status is seen in approximately one-half of patients with SBP [8,10]. Both the infection

itself and hepatic decompensation may contribute to this problem. Ammonia levels do not correlate well with mental status [11].

The Reitan trail test is helpful in detecting subtle changes in mental status in patients with cirrhosis (figure 1 and figure 2) [12]. It is a timed connect-the-numbers test. Patients without hepatic encephalopathy should finish the test in a number of seconds less than or equal to their age in years. In other words, patients who are 50 years old should be able to finish the test in ≤50 seconds. If such patients cannot, they probably have hepatic encephalopathy. (See "Hepatic encephalopathy in adults: Clinical manifestations and diagnosis", section on 'Psychometric tests'.)

The test can be administered in the clinic or on the ward by a clinician, nurse, or assistant. It is more helpful, cheaper, and more rapidly available than a plasma ammonia concentration. The key is having a copy of the test on hand. The test traditionally has two parts, though we only use the first (part A) (figure 1) since, in our experience, the second part can be confusing and does not add important clinical information.

Diarrhea — Diarrhea is common in patients with SBP [10]. An alteration in gut flora with overgrowth of one organism (usually Escherichia coli) has been documented in an animal model of cirrhosis and SBP [13]. These animals regularly develop diarrhea as this occurs, followed by extraintestinal dissemination of the pathogen, which may herald the onset of ascitic fluid infection. (See "Pathogenesis of spontaneous bacterial peritonitis".)

Paralytic ileus, hypotension, hypothermia — These more severe signs are indicative of advanced infection and a poor likelihood of survival. It is important to detect infection and begin antibiotic treatment before this stage is reached. (See 'Importance of early recognition' above.)

Laboratory abnormalities — Occasionally, an infected patient with cirrhosis will have no clinical signs or symptoms, but will have subtle laboratory signs of infection. These include leukocytosis, metabolic acidosis, and azotemia. The otherwise unexplained presence of one or more of these abnormalities should prompt abdominal paracentesis in a patient with cirrhosis and ascites.

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Portal hypertension and ascites".)

SUMMARY AND RECOMMENDATIONS

- **Background –** Spontaneous bacterial peritonitis (SBP) is defined as an ascitic fluid infection without an evident intra-abdominal surgically treatable source. Patients with SBP generally have advanced cirrhosis; the higher the Model for End-stage Liver Disease (MELD) score, the higher the risk of SBP. Patients almost always develop SBP in the setting of large-volume, clinically-obvious ascites. (See "Pathogenesis of spontaneous bacterial peritonitis".)

  It is important to recognize spontaneous bacterial peritonitis early in the course of infection because there is frequently a very short window of opportunity during which to intervene to ensure a good outcome. If the opportunity is missed, shock ensues, followed rapidly by multisystem organ failure. (See 'Importance of early recognition' above.)

- **Clinical manifestations –** The signs and symptoms of SBP are subtle compared with those seen in patients with bacterial peritonitis in the absence of ascites. By separating the visceral from the parietal peritoneal surfaces, ascites prevents the development of a rigid abdomen. Approximately 13 percent of patients with SBP have no signs or symptoms of infection at the time of diagnosis. (See 'Clinical manifestations' above.)

  SBP should be suspected in patients with ascites due to advanced cirrhosis who develop symptoms such as fever, abdominal pain/tenderness, and altered mental status (table 1). Other signs and symptoms of SBP include diarrhea, paralytic ileus, hypotension, hypothermia, and laboratory abnormalities, such as a peripheral leukocytosis, metabolic acidosis, and azotemia. (See 'Clinical manifestations' above.)

  - Fever **–** Fever is the most common clinical manifestation of SBP. It is important to appreciate that patients with advanced cirrhosis are usually mildly hypothermic. Thus, a temperature of 37.8°C (100°F) or greater must be evaluated. (See 'Fever' above.)

  - Abdominal pain **–** Diffuse abdominal pain is the hallmark of peritonitis. However, the pain can be very subtle in SBP due to the presence of ascites. Abdominal tenderness can also be subtle in SBP. Patients do not develop a rigid abdomen, although rebound may be present in advanced cases. (See 'Abdominal pain and tenderness' above.)

  - Altered mental status **–** The clinical sign of infection that is frequently overlooked in patients with cirrhosis is a subtle change in mental status. The Reitan trail test is a diagnostic aid to help detect subtle changes in mental status in patients with cirrhosis (figure 1 and figure 2). (See 'Altered mental status' above.)

- **Diagnosis –** The diagnosis of SBP is established by a positive ascitic fluid bacterial culture, an elevated ascitic fluid absolute polymorphonuclear leukocyte (PMN) count (≥250 cells/mm^3), and exclusion of secondary causes of bacterial peritonitis. (See "Spontaneous bacterial peritonitis in adults: Diagnosis".)

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Topic 1247 Version 24.0

GRAPHICS

Signs and symptoms at the time of diagnosis in 489 patients with spontaneous bacterial peritonitis

Clinical feature	Percent with sign or symptom
Fever	69
Abdominal pain	59
Altered mental status	54
Abdominal tenderness	49
Diarrhea	32
Paralytic ileus	30
Hypotension	21
Hypothermia	17

Data from McHutchison JG, Runyon BA. Spontaneous bacterial peritonitis. In: Gastrointestinal and Hepatic Infections, Surawicz CM, Owen RL (Eds), WB Saunders Company, Philadelphia 1994. p.455.

Graphic 71038 Version 2.0

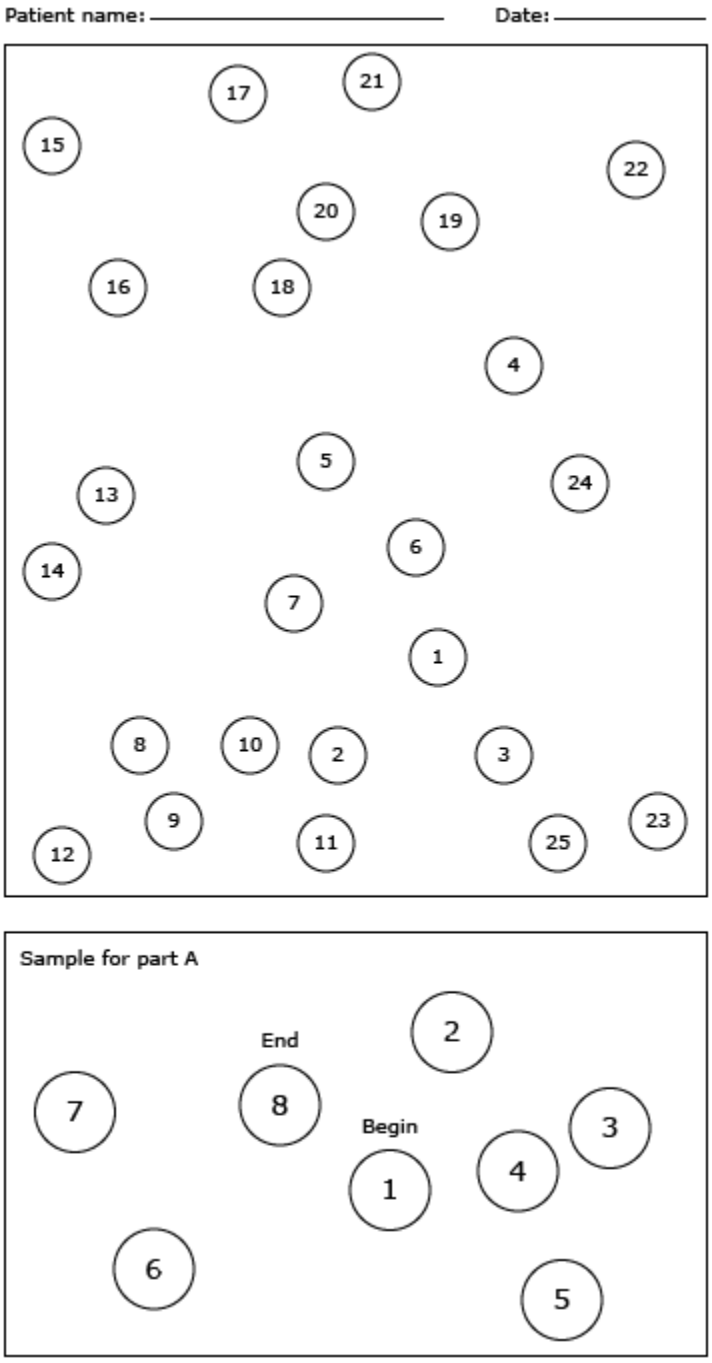
Indications for abdominal paracentesis in a patient with ascites

New onset ascites
At the time of each admission to the hospital
Clinical deterioration, either inpatient or outpatient
Fever
Abdominal pain
Abdominal tenderness
Mental status change
Ileus
Hypotension
Laboratory abnormalities that may indicate infection
Peripheral leukocytosis
Acidosis
Worsening of renal function
Gastrointestinal bleeding (a high risk time for infection)

Reference: Runyon BA, AASLD. Introduction to the revised American Association for the Study of Liver Diseases Practice Guideline management of adult patients with ascites due to cirrhosis 2012. Hepatology 2013; 57:1651.

Graphic 64189 Version 3.0

Reitan Test for hepatic encephalopathy (part A)



The Reitan Test (number connection test) is a commonly used bedside test that is useful for screening for hepatic encephalopathy.

- Step 1: Make sure that the patient is alert enough to cooperate for this test, can see adequately, has a writing surface, is able to count, and can hold a pen or pencil.
- Step 2: Demonstrate to the patient how to connect the numbers on the sample for part A (lower box).
- Step 3: Inform the patient that you will be timing the test and to complete the number connections from 1 to 25 as fast as

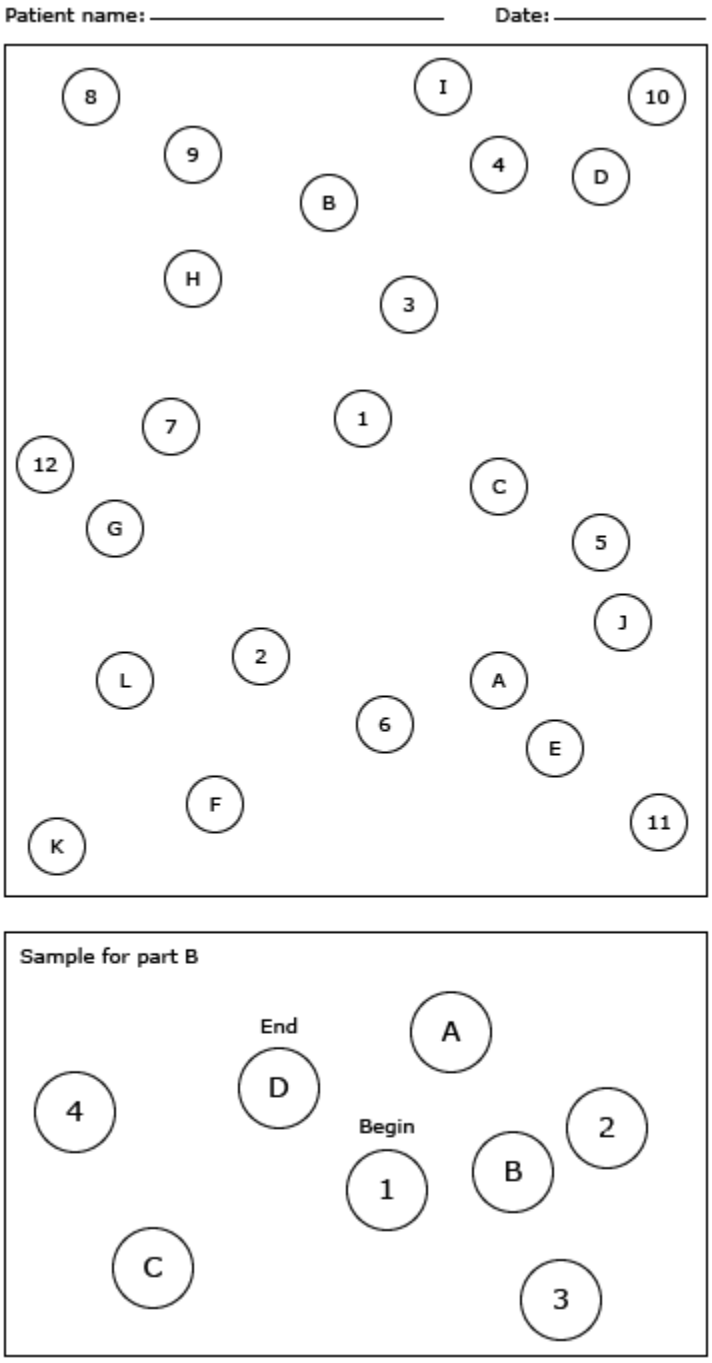
the patient can without lifting the pen or pencil from the paper.

- Step 4: If an error occurs, point it out immediately and allow the patient to correct the error. The total elapsed time to complete the test, including the time spent correcting errors, is the score.
- Step 5: Record the time spent to complete the test. If it takes longer than 3 minutes to complete test A, record ">3 minutes" as the score.

An alert person without hepatic encephalopathy should be able to complete part A of the test in seconds similar to their age in years.

Graphic 83108 Version 5.0

Reitan Test for hepatic encephalopathy (part B)



The Reitan Test (number connection test) is a commonly used bedside test that is useful for screening for hepatic encephalopathy. Part B of the test may follow completion of part A, but is not used by all clinicians.

- Step 1: Make sure that the patient is alert enough to cooperate for this test, can see adequately, has a writing surface, is able to count, and can hold a pen or pencil.
- Step 2: Demonstrate to the patient how to connect the numbers and letters on the sample for part B (lower box),

alternating between the numbers and letters (ie, 1-A-2-B-3-C, etc).

- Step 3: Inform the patient that you will be timing the test and to complete the number-letter connections from 1 to L as fast as the patient can without lifting the pen or pencil from the paper.
- Step 4: If an error occurs, point it out immediately and allow the patient to correct the error. The total elapsed time to complete the test, including the time spent correcting errors, is the score.
- Step 5: Record the time spent to complete the test. An average score is 75 seconds, while >273 seconds is considered deficient.

Graphic 83109 Version 3.0

Contributor Disclosures

Bruce A Runyon, MD, FAASLD No relevant financial relationship(s) with ineligible companies to disclose. **Keith D Lindor, MD** Consultant/Advisory Boards: Pliant [DSMB member]. All of the relevant financial relationships listed have been mitigated. **Kristen M Robson, MD, MBA, FACG** No relevant financial relationship(s) with ineligible companies to disclose.

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