# Dr. RAJENDRAN'S INSTITUTE OF MEDICAL EDUCATION

## SPONTANEOUS BACTERIAL PERITONITIS (SBP) (26 Q and A)

## Diagnosis (13)

### 1) What are the symptoms of SBP?

- As many as 15% of patients are completely asymptomatic.
  - A high index of suspicion must be maintained in patients with ascites.

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*Signs and symptoms*

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1. Fever – 70%
2. Abdominal pain – 60%
3. Altered mental status (encephalopathy) – 55%
4. Abdominal tenderness – 50%
5. Diarrhea – 30%
6. Paralytic ileus – 30%
7. Hypotension – 20%
8. Hypothermia – 15%

### 2) Which physical findings are characteristic of SBP?

- Fever is the most common clinical manifestation of SBP.
- Diffuse abdominal pain is the hallmark of peritonitis.
  - The pain is usually diffuse and continuous.
  - The pain can be very subtle in SBP due to the presence of ascites, and some patients are asymptomatic.
- Abdominal tenderness can be subtle in SBP.
  - No rigid abdomen.
  - Rebound tenderness may be present in advanced cases.
- Altered mental status
  - A subtle change in mental status is frequently overlooked in the patient with cirrhosis.
    - The alteration in mental status may be so subtle that it can only be detected by a spouse
  - Patients may present with frank delirium, confusion, or cognitive slowing.

- Paralytic ileus, hypotension, and hypothermia 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.

3) Why is it important to suspect spontaneous bacterial peritonitis early in the course of infection?

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.

4) When will you suspect SBP?

- SBP should be suspected in patients with ascites due to advanced cirrhosis who develop fever, abdominal pain, abdominal tenderness, altered mental status, or hypotension.
- A low clinical suspicion for SBP does not obviate the need for paracentesis.

5) What is the role of paracentesis in the evaluation of SBP?

- All patients suspected of having SBP must undergo immediate peritoneal fluid analysis.
    - Ultrasonography may aid paracentesis if ascites are minimally detectable or questionable.
    - It is vital that paracentesis is done before receiving any antibiotics.
        - A single dose of a broad-spectrum antibiotic can lead to no growth in 85% of patients after six hours).
    - Send the fluid for cell count, differential, and culture.

6) What are the indications for abdominal paracentesis in a patient with ascites?

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*Indications for abdominal paracentesis in a patient with ascites*

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1. New onset ascites
2. At the time of each admission to the hospital
3. Clinical deterioration
    a. Fever
    b. Abdominal pain
    c. Abdominal tenderness
    d. Mental status change
    e. Ileus
    f. Hypotension

4. Laboratory abnormalities that may indicate infection
    a. Peripheral leukocytosis
    b. Acidosis
    c. Worsening of renal function
5. Gastrointestinal bleeding (a high-risk time for infection)

## 7) What is the role of ascitic fluid studies in the workup of SBP?

- An ascitic fluid *absolute* neutrophil count of more than 250 cells/µL is the single best predictor of spontaneous bacterial peritonitis.
    - The absolute PMN count in the ascitic fluid is calculated by multiplying the total white blood cell count (or total "nucleated cell" count) by the percentage of PMNs in the differential.
    - The cell count and differential are performed manually, so the accuracy depends on the skill of the medical technologist.
- Raised lactate dehydrogenase (LDH) in ascitic fluid
    - LDH in ascitic fluid is released from PMNs that have lysed.
    - The concentration is increased in SBP and is even further elevated in secondary bacterial peritonitis.

## 8) What is the role of serum-ascites albumin gradient in the workup of SBP?

The vast majority of patients with SBP have advanced cirrhosis with portal hypertension. The serum-ascites albumin gradient indirectly measures portal pressure. It is helpful in the diagnosis of SBP because, with the exception of patients with nephrotic syndrome, SBP rarely develops in patients who do not have portal hypertension.

To obtain SAAG, *subtract* ascitic fluid albumin value from serum albumin concentration. If the difference (not a ratio) is >1.1 g/dL, the patient has portal hypertension, with 97 percent accuracy. If the difference is <1.1 g/dL, portal hypertension is not present, and SBP is unlikely (see table below).

*Classification of ascites by the serum-to-ascites albumin gradient*

| **High albumin gradient (SAAG ≥1.1 g/dL)** |
|---|
| *1. Cirrhosis* |
| *2. Alcoholic hepatitis* |
| *3. Heart failure* |
| *4. Massive hepatic metastases* |
| *5. Heart failure/constrictive pericarditis* |
| *6. Budd-Chiari syndrome* |
| *7. Portal vein thrombosis* |
| *8. Idiopathic portal fibrosis* |
| **Low albumin gradient (SAAG <1.1 g/dL)** |
| *1. Peritoneal carcinomatosis* |

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|---|
| 2. *Peritoneal tuberculosis* |
| 3. *Pancreatitis* |
| 4. *Serositis* |
| 5. *Nephrotic syndrome* |

### 9) What is the role of Gram stain of ascitic fluid in the workup of SBP?

Gram stain is very insensitive for detecting SBP and is associated with a high false-positive rate. However, a Gram stain can help differentiate SBP from secondary bacterial peritonitis due to gut perforation. In the latter, the Gram stain may show multiple different bacterial forms.

### 10) How is a diagnosis of SBP confirmed?

- The diagnosis of SBP is confirmed by-
  - a positive ascitic fluid bacterial culture,
  - an elevated ascitic fluid *absolute* polymorphonuclear leukocyte (PMN) count (≥250 cells/mm3), and
  - exclusion of secondary causes of bacterial peritonitis.
- An elevated ascitic fluid absolute PMN count (≥250 cells/mm3) is adequate to make a presumptive diagnosis of SBP and to start empiric therapy.
  - The cultures are commonly negative when the paracentesis is performed after antibiotics are initiated and/or inadequate culture technique is used.

The absolute PMN count in the ascitic fluid is calculated by multiplying the total white blood cell count (or total "nucleated cell" count) by the percentage of PMNs in the differential.

### 11) How will you distinguish SBP from secondary bacterial peritonitis?

*Secondary bacterial peritonitis*

Patients with secondary bacterial peritonitis have a surgically treatable source of infection (eg, perforated duodenal ulcer, perinephric abscess).

- The mortality of secondary bacterial peritonitis approaches 100 percent without surgical intervention.
- Patients with suspected secondary bacterial peritonitis should undergo emergency plain and upright abdominal films and a CT scan of the abdomen.

*Clinical signs and symptoms*

- The signs and symptoms of both SBP and surgical peritonitis in the presence of ascites can be surprisingly subtle.
  - Ascites prevent the development of a rigid abdomen by separating the visceral from the parietal peritoneal surfaces. Thus, even with frank perforation of the colon and leakage of fecal material into the peritoneal cavity, a classic surgical abdomen does not develop.

*Ascitic fluid analysis*

- In secondary bacterial peritonitis from free perforation of a viscus, the peritoneal fluid analysis characteristically shows an extremely elevated polymorphonuclear neutrophil count, multiple organisms (often including fungi and Enterococcus) on Gram stain and culture, and at least two of the following criteria (Runyon's criteria):
  - Total protein greater than 1 g/dL
  - Lactate dehydrogenase above the upper limit of normal for serum
  - Glucose less than 50 mg/dL

## 12) What are culture-negative neutrocytic ascites?

Combining the results of the ascitic fluid polymorphonuclear neutrophil (PMN) count and the ascitic fluid culture yields the following subgroups:

1. Spontaneous bacterial peritonitis
2. Culture-negative neutrocytic ascites (probable spontaneous bacterial peritonitis)
3. Monomicrobial non neutrocytic bacterascites

| Variant | Ascitic fluid culture | Absolute PMN per mm3 |
|---|---|---|
| Spontaneous bacterial peritonitis | Positive | ≥250 |
| Culture-negative neutrocytic ascites | No growth | ≥250 |
| Monomicrobial non-neutrocytic bacterascites (single organism) | Positive | <250 |

Spontaneous bacterial peritonitis is diagnosed when the PMN count is 250 cells/µL or higher, in conjunction with a positive bacterial culture result. One organism is usually identified in the culture in most cases; these patients should receive antibiotic therapy.

*Culture-negative neutrocytic ascites (probable spontaneous bacterial peritonitis)*

- This is diagnosed when the ascitic fluid culture results are negative, but the PMN count is 250 cells/µL or higher.
  - It may be the result of poor culturing techniques or late-stage resolving infection.
- Most patients with culture-negative neutrocytic ascites actually have SBP.
  - These patients should be treated just as aggressively as those with positive culture results.

*Monomicrobial non neutrocytic bacterascites*

This exists when a positive culture result coexists with a PMN count of 250 cells/µL or fewer. 40% of these patients subsequently develop spontaneous bacterial peritonitis. Therefore, monomicrobial non neutrocytic bacterascites may represent an early form of spontaneous bacterial peritonitis; this may often be the result of contamination of bacterial cultures.

13) What is the role of blood and urine cultures in the workup of SBP?

Blood and urine cultures should be obtained in all patients suspected of having spontaneous bacterial peritonitis.