Review Article

Spontaneous Bacterial Peritonitis: An Overview

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Summary

Spontaneous bacterial peritonitis (SBP) is a risky complication that occurs amongst cirrhotic patients with ascites. SBP develops in approximately 10 to 30% and has an estimated in-hospital mortality rate of 20%. SBP outcomes from translocation of bacteria from the intestinal lumen. Also, SBP results from a bacteremia that initiates at a distant site, such as a urinary tract infection. The majority of cases of SBP are produced by gram-negative enteric organisms, such as Escherichia coli *and* Klebsiella pneumonia. *Third-generation, broad-spectrum cephalosporins continue a good initial choice for SBP treatment. Levofloxacin is an acceptable alternative for patients not receiving long-term flouroquinolone prophylaxis or for those with a penicillin allergy. Different antibiotics such as pipercillin-tazobactam should be considered for patients with nosocomial SBP or for patients who fail to improve on traditional antibiotic regimens.*

Keywords: *Spontaneous bacterial peritonitis, Cirrhosis, Ascites and gram-negative enteric organisms.*

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Introduction

Bacterial infections are a recognized cause of morbidity and mortality in cirrhotic patients, being a chief etiology of progression in liver failure[1]. Spontaneous bacterial peritonitis (SBP) and urinary tract infections are the greatest frequent infections in this setting[2]. SBP is defined as a bacterial infection, usually monomicrobial, of ascitic fluid, deprived of an evident source of sepsis in the peritoneum or adjacent tissues, arising in subjects with decompensated liver diseases[3].

Pathogenesis

In cirrhotic patients with portal hypertension, there disturbs micro circulation in the intestinal mucosa permitting decreased mucosal blood flow, impaired mucosal integrity and intestinal bacterial-overgrowth resulting in bacterial- translocation[4]. Moreover, disturbed gastrointestinal motility and reduced local and humeral immunity in those patients pave the way for bacterial overgrowth and translocation[5]. Gram-negative bacilli are the commonest cause of spontaneous bacterial peritonitis (SBP) mostly E. coli that accounts for about 46% of cases, other common organisms include Klebsiella, other Enterobacteriaceae and Pseudomonas. Certain gram-positive bacteria accounted (less than 25%) share in SBP development as Streptococcus pneumonia, Staphylococcus aureus and Enterococcus species[3].

Incidence

The incidence of SBP in cirrhotic patients ranges from 1.5% to 3.5% in outpatients compared to 7% to 30% in hospital admitted patients[6]. And the annual recurrence rate accounts for about 70%[7].

Risk factors

A number of risk factors are linked with the incidence of SBP such as, previous history of SBP, recent gastrointestinal bleeding and severe liver dysfunction[8]. Also ascetic fluid total protein < 1.5 gm/dl may be linked to decreased opsonic activity and reported as a predictive factor for the incidence of SBP 6. Additional genetic risk factors are associated with SBP as, Toll-like receptor 2 (TLR2) proteins that are expressed on the surface of macrophages and are important for host cell defense through microbial recognition[9]. Also, some variants of the NOD2 (nucleotide-binding oligomerisation domain containing 2)

gene were have also shown to increase the risk of SBP[10]. Proton pump inhibitors (PPI) were also found to impair natural host defense against ingested bacteria via increased gastric PH and is recognized as an independent risk factor for SBP in advanced cirrhosis[11].

Diagnosis

Abdominal pain may be continuous and differs from that of tense ascites with tenderness is a common feature. Hypotension, paralytic ileus and hypothermia may also be seen in advanced illness. About 13% of ascetic patients developing SBP may have no symptoms or signs[12]. SBP is a bacterial infection of the ascitic fluid in the lack of any apparent intra-abdominal source of infection or malignancy[13]. The diagnosis of SBP based on, ascetic fluid polymorphonuclear cell (PMN) count $\geq$ 250 cells/mm^3 regardless of the outcome of the culture(CNNA). Bacterascites is also diagnosed in 3%-4% of cirrhotic patients with ascites whose ascetic fluid PMN count < 250 cells/mm 3 and positive microbiological culture of ascites[14]. All these variants of SBP must be differentiated from secondary peritonitis resulting from, gastrointestinal perforation or abscess as the later has higher mortality compared to SBP, in addition, surgical treatment should be considered in secondary bacterial peritonitis but in no way in SBP[15]. PMN count in the ascetic fluid is the gold standard for diagnosis of SBP, but diagnostic paracentesis is not always available, therefore, some laboratory markers have been developed to help early diagnosis and prediction of treatment response[16]. For example interleukin-6 and TNFα were significantly higher in the ascitic fluid of patients with SBP than in those with sterile ascites and are associated with higher rates of renal impairment as a complication of SBP in those patients[17]. Serum interferon gamma-induced protein (Ip-10) as well as procalcitonin and calprotectin are also found to be higher in ascetic fluid of SBP patients than those without SBP[18,19]. Simple non-invasive markers may be also used in diagnosis such as platelet indices and neutrophil to lymphocyte ratio [20,21]. The diagnostic algorithm proposed by Runyon (Figure 1) remains the most logical and cost-effective way to handle an abdominal paracentesis specimen[12].

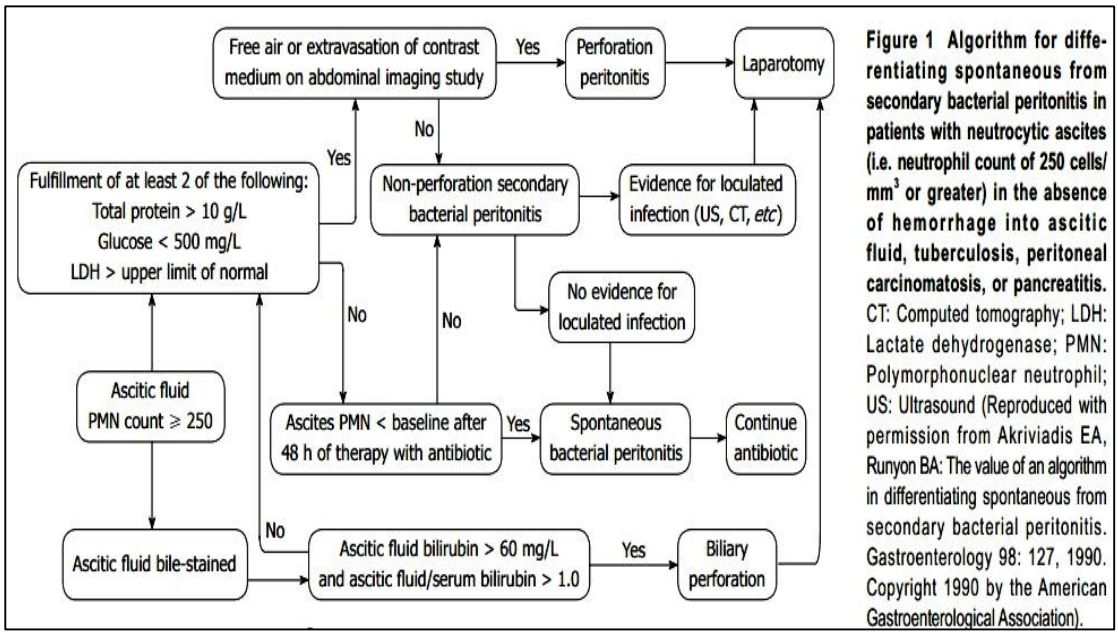

Figure 1 Algorithm for differentiating spontaneous from secondary bacterial peritonitis in patients with neutrocytic ascites (i.e. neutrophil count of 250 cells/mm^3 or greater) in the absence of hemorrhage into ascitic fluid, tuberculosis, peritoneal carcinomatosis, or pancreatitis. CT: Computed tomography; LDH: Lactate dehydrogenase; PMN: Polymorphonuclear neutrophil; US: Ultrasound (Reproduced with permission from Akriviadis EA, Runyon BA: The value of an algorithm in differentiating spontaneous from secondary bacterial peritonitis. Gastroenterology 98: 127, 1990. Copyright 1990 by the American Gastroenterological Association).

Figure (1) showing the diagnostic algorithm proposed by Runyon

Treatment of spontaneous bacterial peritonitis

Empirical antibiotic treatment should be treated as early as possible after diagnosis of SBP to improve survival and decrease complications[22]. Third generation cephalosporins are the antibiotic of choice in SBP because of its favourable safety profile and minimal nephrotoxicity in contrast with other antibiotics[23]. However recent studies demo-

nstrated that, third generation cephalosporins are unsuitable to be used for nosocomial infections in cirrhotic patients because of their decreased efficacy that reached down to 40% due to multi-drug resistant bacteria (MDR) in nosocomial infections[8]. Yet, these drugs are still effective against community acquired infections in cirrhotic patients with success rate of about 80%[24]. According to current guidelines, cefotaxime 2 g every 8 h (6 g/day) is considered the standard treatment[25]. Other regimens include amoxicillin–clavulanic acid, which has comparable results to cefotaxime[26], ampicillin and gentamicin[3]. An additional substitute regimen is fluoroquinolones, which has good ascitic fluid penetration and have similar efficacy compared to cefotaxime in covering E. coli and coagulase negative Staphylococcus in patients not receiving fluoroquinolones prophylaxis[27]. Besides to antibiotics, albumin is a keystone in SBP treatment, especially in patients with renal impairment or chronic kidney disease (CKD), patients with or without dialysis, it also reduces mortality rates both during hospitalization and at-three month follow up after discharge[28].

Prophylaxis

Up to date studies demonstrated a significant reduction in SBP recurrence rate in patients who receive antibiotic prophylaxis[29]. But unhappily, expanded antibiotic use is linked with emergence of MDR strains which is a serious concern all over the world[24]. Norfloxacin is the most widely studied antibiotic for prophylaxis in SBP, it is used for both primary and secondary prophylaxis and remain one of the main choices for selective intestinal decontamination[3]. Ciprofloxacin is too used for SBP prophylaxis and studies demonstrated that, patients with ascetic fluid total protein <1.5 gm/dl had higher one year survival rate when taking ciprofloxacin 500 mg/day 30. A new study establishes that rifaxamin is as effective as other systemically absorbed antibiotics for both primary and secondary prophylaxis. Therefore, it should be particularly considered in cases of quinolone resistance[29,31]. One more study showed that one daily dose of double strength trimethoprim–sulfamethoxazole is associated with decreased SBP risk[32].

Diet

Patients with decompensated cirrhosis are usually suffering from malnutrition and have continuous protein catabolism[33]. Malnutrition facilitates SBP development through bacterial translocation, however, there is no studies demonstrating the role of diet in prevention or treatment of SBP[3].

Prognosis

The mortality rate from SBP had markedly decreased as a result of early diagnosis and prompt antibiotic treatment[3]. The first episode mortality rate is about 10%-50% versus 31%-93% for recurrent episodes[22, 34]. MELD and Child–Pugh scores were found to be reliable indicators of patient outcome. Besides, renal impairment, which occurs in 30%-40% of SBP cases is the best biochemical indicator of mortality in these patients[35].

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