Small Bowel Bacterial Overgrowth in Patients with Alcoholic Cirrhosis

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A total of 89 patients with alcoholic cirrhosis and 40 healthy subjects were included in a study to assess the prevalence of intestinal bacterial overgrowth and to analyze its relationship with the severity of liver dysfunction, presence of ascites, and development of spontaneous bacterial peritonitis (SBP). Bacterial overgrowth was measured by means of a breath test after ingestion of glucose. Intestinal bacterial overgrowth was documented in 27 (30.3%) of the 89 patients with alcoholic cirrhosis and in none of the healthy subjects. The prevalence of intestinal bacterial overgrowth was significantly higher in cirrhotics with ascites (37.1%) than in those with no evidence of ascites (5.3%) and among patients with Pugh-Child class C (48.3%) than in patients with class A (13.1%) or B (27%). Twelve (17.1%) of the 70 patients with ascites developed an episode of SBP. The prevalence of spontaneous bacterial peritonitis was significantly higher in patients who had intestinal bacterial overgrowth (30.7%) than in patients who did not (9.09%). We conclude that intestinal bacterial overgrowth occurs in approximately one third of patients with cirrhosis secondary to alcohol, particularly in patients with ascites and advanced liver dysfunction. Moreover, bacterial overgrowth may be a condition favoring infection of the ascitic fluid.

KEY WORDS: alcoholic liver cirrhosis; intestinal bacterial overgrowth; bacterial translocation; ascites; spontaneous bacterial peritonitis.

Bacteremia and spontaneous bacterial peritonitis (SBP) are common complications in patients with liver cirrhosis. The majority of these infections are caused by enteric gram-negative bacilli, most often Enterobacteriaceae. The mechanism by which bacteria infect the ascites fluid is poorly understood. Hematogenous spread during spontaneous bacteremia or leakage of bacteria from the intestinal tract are possible sources of infection. The passage of viable indigenous bacteria from the gastrointestinal tract through the intact epithelial mucosa to the mesenteric lymph nodes and other organs has been termed bacterial translocation (1). Intestinal bacterial overgrowth is known to lead to increased bacterial translocation (2).

The excessive use of alcohol is a significant factor in the causation of quantitative and qualitative changes in jejunal microflora (3). An increased frequency of bacterial overgrowth in the small intestine has been found in patients with chronic relapsing pancreatitis secondary to alcohol (4) and in patients with alcoholic liver disease (5, 6). Moreover, intestinal bacterial overgrowth in alcoholics may be particularly relevant, since microorganisms have a large capacity for ethanol oxidation, which could lead to generation of po-
tentially hepatotoxic products, such as acetaldehyde (7).

This study was undertaken to assess the prevalence of intestinal bacterial overgrowth in patients with alcoholic cirrhosis and to analyze its relationship with the severity of liver dysfunction, presence of ascites, and development of SBP.

MATERIALS AND METHODS

The study involved 89 patients with alcoholic cirrhosis (23 females, 66 males; mean age 54 years, range 30–71 years) and 40 healthy subjects with no history of alcohol intake and without significant gastrointestinal symptoms (12 females, 28 males; mean age 51 years, range 25–68 years). All patients had a history of drinking at least 80 g ethanol daily for more than five years. At the time of the study, 63 patients admitted regular alcohol consumption and the remaining 26 declared abstinence. Histologic evidence of liver cirrhosis was documented in all patients. Other forms of cirrhosis or other disorders known to cause chronic liver disease (viral infections, Wilson’s disease, α1-antitrypsin deficiency, hemochromatosis, primary biliary cirrhosis, etc) were excluded. Anatomical conditions promoting intestinal stasis or recirculation of enteric contents, such as small intestinal diverticula, surgical blind loops, fistulas, etc, were excluded by means of a barium small bowel series. Excluded also were all patients with conditions associated with impaired motility, including diabetes mellitus, scleroderma, and intestinal pseudoobstruction as well as those patients who had received antimicrobial agents or lactulose in the month preceding the study. The study protocol was approved by the Ethical Committee of our institution and all participants signed the informed consent.

An abdominal ultrasound examination was carried out in all patients. The 70 patients in whom ascites was sonographically demonstrated underwent abdominal paracentesis, and a fraction of the ascitic fluid recovered was used for biochemical, cytologic, and bacteriologic study. The stage of cirrhosis was determined according to the Pugh-Child score (8). At the time of inclusion, there were 23 patients with Pugh-Child class A, 37 with class B, and 29 with class C. Most patients were assessed in-hospital, usually within the first five days of hospitalization. SBP developed in 12 hospitalized patients (neutrophil count in the ascitic fluid >250 cells/μl). A positive ascitic fluid culture was obtained in eight patients (Escherichia coli was isolated in seven cases and Bacteroides fragilis in one).

Bacterial overgrowth was measured by means of a breath test (9). After fasting overnight (15 hr) H2 exhalation (HE) was measured for 120 min (15-min intervals) following the ingestion of 50 g glucose by using a gas chromatograph (Quintron MicroLyze). Results were expressed in parts per million (ppm). The detection of HE > 20 ppm in basal conditions or a ≥20 ppm increase in baseline values after glucose ingestion was considered as evidence of small intestine bacterial overgrowth.

All values are expressed as mean values ± standard deviation (SD) of the mean. Student’s t test, chi-square test (χ²), and Fisher’s exact probability test were used for statistical data analysis. The level of significance was taken at P < 0.05.

RESULTS

Intestinal bacterial overgrowth was documented in 27 (30.3%) of the 89 patients with alcoholic cirrhosis and in none of the healthy subjects. There were no statistically significant differences between patients with and without evidence of bacterial overgrowth with regard to the male–female ratio (16/9 vs 50/14), age (52.7 ± 11.1 vs 55 ± 10.8 years), alanine aminotransferase activity (70.9 ± 42.7 vs 54.1 ± 36.2 IU/liter), α-glutamyltranspeptidase levels (116.8 ± 86.9 vs 120.8 ± 119.2 IU/liter), and mean corpuscular volume of erythrocytes (99.2 ± 10.7 vs 96.7 ± 11.5fl).

The prevalence of intestinal bacterial overgrowth was significantly higher in cirrhotics with ascites (37.1%) than in those with no evidence of ascitic fluid in the peritoneal cavity (5.3%) (χ² = 5.260, P = 0.022). All cases but one of bacterial overgrowth were found in patients with ascites.

In the group of 27 patients with intestinal bacterial overgrowth, there were 3 (11.1%) patients with Pugh-Child class A, 10 (37.1%) with class B, and 14 (51.8%) with class C. The corresponding figures in the group of 62 patients without intestinal overgrowth were 20 (32.2%), 27 (43.5%), and 15 (24.2%) patients, respectively. Bacterial overgrowth was significantly more frequent among patients with Pugh-Child class C (14/29, 48.3%) than in patients with class A (3/23, 13.1%) or B (10/37, 27%) (χ² = 7.794, P = 0.02) (Figure 1).

Twelve (17.1%) of the 70 patients with ascites

![Graph](image)