Introduction of Breath Testing to Diagnose Small Intestinal Bacterial Overgrowth at Texas Tech University Health Sciences Center / UMC

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CASE REPORT

E.P.C.M.S.

ABSTRACT
Small intestinal bacterial overgrowth (SIBO) is a condition that is defined as an increase in the number of bacteria in the intestinal lumen due to various underlying conditions. Patients present with a spectrum of symptoms ranging from bloating, gas, abdominal distension, borborygmi, variable amount of abdominal pain, diarrhea, changes in bowel habits, weight loss, as well as some symptoms related to malabsorption of fat-soluble vitamins (including vitamin A, D, E) and possibly B12. Its prevalence has not been accurately assessed due to underdiagnosis and misdiagnosis. The gold standard for diagnosis is jejunal aspirates with bacterial culture, however this method is invasive and cultures do not capture many suspected organisms. Glucose and lactulose breath tests have been developed to help diagnose this condition. The Gastrointestinal Motility Center at Texas Tech / UMC introduced small bowel breath testing in 2011 to evaluate patients both referred to and presenting for care at our institution with symptoms suggesting SIBO. We report here the results for the method where hydrogen and methane levels are measured every 20 minutes for a total of 180 minutes after administration of 100 grams glucose substrate. Positive results require levels of hydrogen to exceed 20 ppm and methane to be greater than 10 ppm after the glucose challenge. Overall, 51.2% of patients tested were positive. The majority, 35.3% (42 out of 119) of patients who underwent the test were positive based on hydrogen criteria, while a further 16% (19/119) had a positive methane response. We conclude that the small bowel breath test is an important addition to the gastroenterological studies now available to patients in El Paso. This test permits the diagnosis of SIBO in patients where symptoms were not previously explained and provides the rationale for appropriate treatment to be initiated.

BACKGROUND
Small intestinal bacterial overgrowth (SIBO) is defined as an increase in the number of bacteria mostly of colonic origin and some native to the particular region of the small bowel. This leads to excessive fermentation, inflammation, and malabsorption due to contact with ingested nutrients. Several conditions predispose patients to SIBO: The main entities being loss of the ileocecal valve related to surgery, decreased gastric acid secretion, small bowel and gastric surgeries, small bowel diverticula, radiation therapy, systemic sclerosis, immunodeficiency, advanced age, and stasis related to narcotic effects on the gut. A decrease in brush border disaccharidases by bacterial proteases may produce carbohydrate malabsorption, which leads to a component of osmotic diarrhea. Diarrhea occurring at night, sometimes in the setting of fecal incontinence, is an important “clinical pearl” for SIBO. Abdominal bloating and pain and borborygmi result from bacterial production of hydrogen and methane. Diagnostic tests include small intestinal aspirates with culture of aerobes and anaerobes and breath tests that measure hydrogen or methane excretion from bacteria in the small bowel after administration of a substrate (glucose or lactulose).

The prevalence of SIBO is unknown, since this condition is underdiagnosed. Typical symptoms are bloating, particularly postprandially, abdominal distension, awareness of increased passage of gas, borborygmi, variable descriptions of abdominal pain and change in stooling - ranging from loose to constipated. Patients may not seek healthcare resorting more to the counter approaches and diet, or it may not be adequately investigated. The gold standard for diagnosis is jejunal aspirates with aerobic and anaerobic cultures. However this test is invasive and culture techniques can only account for a minority of the organisms that could be colonizing the small bowel. In addition, it is not available in the majority of medical and referral centers. Hydrogen and methane are produced by bacteria normally residing in the large intestine in healthy individuals (see Figure 1), but these bacteria can also colonize the small intestine in patients with certain predisposing clinical settings leading to SIBO. About 20% of hydrogen and methane produced in the intestine is exhaled by the lungs and can be measured in the breath, while 80% is expelled by flatus. After glucose intake, there is an early increase in breath hydrogen and/or methane due to glucose fermentation by bacteria in the small intestine. Breath tests are now the most patient friendly and available diagnostic methods, since these are non-invasive and also available in an office setting. However, these tests have not been standardized and protocols differ in dose of the substrate, duration of tests, time intervals of sampling, and cut-off values. Proposed values for a positive test have been described by several authors and relate to increases in hydrogen and/or methane after challenge with glucose. Sometimes elevated basal levels exceeding the usual upper limit of 10 parts per million (ppm), can be present before glucose ingestion.

The following article presents the experience at the Gastrointestinal Motility Center at Texas Tech / UMC where this methodology has been recently introduced to aid in the management of patients presenting with symptoms that had eluded any specific diagnosis. The finding of SIBO then sets the stage for treatment and follow up approaches based on an accurate diagnosis.

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METHODS

A total of 119 patients who presented with symptoms ranging from nausea, vomiting, changes in weight, constipation, diarrhea, bloating, excessive gas, abdominal distension and pain were evaluated for possible small intestinal bacterial overgrowth (SIBO) utilizing glucose breath test between 2012 and 2013. Of the 119 patients, 108 were female and 11 male, with an average age of 51.2 years (18 to 88 years old). Patient preparation guidelines are: no antibiotics for the preceding one month; no tofu or beans or large protein meals the night before the test; no smoking or sleeping during the study; and brushing of teeth +/- mouthwash before the baseline samples to address oral hygiene. Patients only have to take a normal breath and exhale once per breath sample. Our equipment is a Quintron BreathTracker SC Digital Microlyzer with carbon dioxide calibration. Hydrogen and methane levels in breath are measured in two breath samples in the baseline period before administration of 100 grams of glucose and then at consecutive 20 minute intervals for a total of 180 minutes after ingestion. A positive test was considered if the baseline for hydrogen was < 10 ppm and there was an increase to > 20 ppm at any time during the 180 minute period; or if the baseline for methane was < 10 ppm and subsequently increased to > 10 ppm during the 180 minute period. A baseline (an average of two samples) hydrogen > 10 ppm with a sustained rise to ≥ 20 over the 180 minutes was also considered a positive test as well as a methane baseline of > 10 ppm which was sustained during the 180 minute test period.

RESULTS

Of the total of 119 patients evaluated for SIBO using the glucose breath test, 61 patients (51.2%) tested positive based on all the different criteria described. Within the positive group, the majority tested positive with hydrogen. 42 patients (35.3%) had a positive hydrogen breath test comprising 16 with a baseline level of > 10 ppm, and 26 patients with an increase in hydrogen levels to > 20 ppm with their baseline was < 10 ppm. Nineteen (16%) patients had a positive methane breath test; ten with a baseline of > 10 ppm and nine who increased to > 10 ppm when baseline was < 10 ppm.

DISCUSSION

Small intestinal bacterial overgrowth is a condition that is underdiagnosed and misdiagnosed. This condition can even lead to malabsorption of nutrients, fat soluble vitamins, and B12 with implications for weight loss, anemia, and systemic effects if left undiagnosed. Performing a breath test in individuals who present with symptoms suggestive and consistent with this condition should be considered, particularly since it is a non-invasive and inexpensive means of diagnosing this condition. Treatment of SIBO involves a course of antibiotics followed by probiotics, as well as addressing any underlying and predisposing factors that may have contributed to the susceptibility of SIBO. Additional attention to nutrient and dietary aspects are important in long term management.

CONCLUSION

We conclude that small bowel breath testing is an important new addition to the GI testing armamentarium now available for patients in El Paso.

REFERENCES


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