Small-bowel aspiration during upper esophagogastroduodenoscopy: Rao technique

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Small-intestinal bacterial overgrowth (SIBO) and small-intestinal fungal overgrowth (SIFO) are characterized by high levels of bacteria or fungal organisms in the small intestine and are associated with GI symptoms such as bloating, abdominal distention, flatulence, abdominal discomfort, diarrhea, and weight loss. Diagnosis of SIBO and SIFO remain challenging. Although breath testing is noninvasive and used in clinical practice, its sensitivity and specificity remain poorly defined. Small-bowel aspiration and culture during upper endoscopy is generally regarded as the best method for the diagnosis of SIBO and SIFO. However, the optimal technique for aspiration and culture is often debated. In this video manuscript, we describe the Rao technique for small-bowel aspiration during an upper endoscopy.

INTRODUCTION

Intestinal dysbiosis is increasingly recognized as a common cause of GI symptoms.[1] The adult GI tract has nearly 38 trillion bacteria, mostly in the colon.[2] There are very few bacteria in the normal small bowel; if present in sufficient concentrations, however, bacteria can cause symptoms.[3-5] Because of the variability in patient populations and methods used to establish a diagnosis,[6,7] SIBO prevalence has been difficult to estimate. SIBO is defined as the presence of an abnormal number of bacteria in the small intestine, together with symptoms of flatulence, bloating, distension, and other unexplained symptoms such as diarrhea, abdominal pain, dyspepsia, and constipation.[5] SIFO is defined as the presence of excess fungal organisms in the small bowel, together with the aforementioned unexplained GI symptoms.[8]

The diagnosis of SIBO and SIFO has been challenging because patients with either positive or negative duodenal aspirate and/or breath testing report similar symptoms (ie, symptoms alone are poor predictors of SIBO).[7] Consequently, SIBO diagnosis requires specialized testing (Table 1). Glucose breath test and lactulose breath test are generally used. However, the equipment for breath testing is not widely available, the amount of sugar substrates is controversial, and the test interpretation is not standardized and requires further validation.[3-5] A recent North American consensus provided some useful recommendations.[6]

Today, most experts agree and the recent American College of Gastroenterology guidelines further endorsed that small-bowel aspiration is currently the best technique for identifying SIBO, although its limitations include invasiveness, cost, lack of standardization of aspiration and microbiological techniques, and need for collaboration with the microbiology laboratory. Here, we describe our technique of small-bowel aspiration to bridge the knowledge gap so that more endoscopists can adopt this technology and facilitate a proper diagnosis of SIBO.

ENDOSCOPIC METHOD OF SMALL-BOWEL ASPIRATION

In addition to a standard upper endoscope, the equipment needed for this procedure consists of a 6F Liguory catheter

TABLE 1. Small-bowel aspiration for SIBO

Diagnostic test	Procedure	Testing protocol	Test interpretation	Diagnostic performance	Limitations
Duodenal aspirate and culture[6,7]	Upper endoscopy performed to obtain samples from distal second or third portions of duodenum	3 mL of duodenal fluid aspirated using aseptic technique (eg, sterile gloves); sample sent to microbiology laboratory immediately after collection for aerobic, anerobic, and fungal cultures	Positive test: $\geq 10^3$ cfu/mL (65.5% agreement between glucose breath test and duodenal aspirate/culture)	Currently widely accepted as the best diagnostic method for SIBO	Testing is invasive, time intensive, and expensive

SIBO, Small-intestinal bacterial overgrowth.

Figure 1. The equipment needed for the duodenal aspiration procedure includes a 6F Liguory catheter with multiple side holes at its tip, sterile gloves, sterile cap, a 5-mL sterile syringe, and a biohazard bag to transport the syringe with aspirate to the microbiology laboratory.

(COOK Medical, Bloomington, Ind, USA) with multiple side holes at its tip, sterile gloves, sterile cap, and a 5-mL sterile syringe (Fig. 1 and Video 1, available online at www.VideoGIE.org). The catheter assembly is first prepared while sterile gloves are worn. Next, a disinfected upper endoscope is passed into the distal second or third portions of the duodenum, using minimal air insufflation. Care is taken to avoid aspiration of oral or gastric secretions before the catheter is passed and to avoid other manipulations, such as taking a biopsy sample. The endoscopist and assistant then change into sterile gloves to prevent cross contamination. The endoscopist passes the Liguory catheter through the biopsy channel of the endoscope. The assistant usually sits (Fig. 2) for gravity-assisted suction and uses a 5-mL sterile syringe connected to a 3-way stopcock to gently and repeatedly aspirate the fluid. If the lumen is dry, the liver may be gently massaged to facilitate bile flow. Usually, in 2 to 5 minutes, about 3 mL of bile-stained juice is aspirated.[9] The duodenal aspirate is immediately sent to the microbiology laboratory for standard aerobic, anaerobic, and fungal cultures.[7,8,10]

Other techniques include a double-lumen aspiration tube, which is not commercially available in the United States[11]; duodenal aspiration through the endoscope, which has a significant risk of cross contamination and false positive results; and a novel oral diagnostic capsule, the Smart Capsule Bacterial Detection System, which merits validation.[12] A bacterial colony count threshold of $\geq 10^3$ colony-forming units/mL is recommended by most experts and by recent American College of Gastroenterology guidelines as diagnostic for SIBO when using duodenal aspiration,[5,6,13] although some investigators have suggested a higher threshold of $\geq 10^5$ colony-forming units/mL, based on traditional microbiological standards for bacterial infection and for jejunal culture.[11,14-17]

Figure 2. Description of duodenal aspirate collection and handling. The technician flushes the endoscope with sterile water and prepares a sterile field. The endoscope is passed into the second/third portion of the duodenum with minimal air insufflation and suctioning. The endoscopist and the technician wear sterile gloves. The Liguory catheter is advanced through the biopsy channel. The technician holds the syringe lower than the patient to aid sample flow by gravity. Gentle suction is used to aspirate ~3 mL of duodenal fluid; this is immediately sent to the microbiology laboratory for bacterial count and cultures.

INDICATIONS/CONTRAINDICATIONS

The common indications for small-bowel aspiration/culture include persistent flatulence, abdominal bloating, distension, pain, excessive belching without GERD, chronic diarrhea with malabsorption, constipation, and suspected SIBO or SIFO, especially in patients with previous gastric or small intestinal or colonic surgery, connective tissue disorders such as scleroderma or Ehlers-Danlos syndrome, diabetic neuropathy, and gastroparesis. The usual contraindications are those related to high-risk endoscopy and patients who have taken antibiotics in the past 4 to 6 weeks.[5,7]

CLINICAL IMPLICATIONS

Small-bowel aspiration and culture currently provides the most accurate method of detecting the presence of aerobic, anerobic, and fungal organisms. This information not only aids diagnosis of SIBO or SIFO but also provides a reasonable estimate of the severity of colonization by the

organisms, considering that the duodenum is normally sterile, given its close proximity to the acidic stomach, and because of robust motility. Furthermore, the microbiology culture/sensitivity analysis can guide optimal management with appropriate antibiotics.[5,18] The limitations of small-bowel culture include its invasive nature, cost, potential inability to detect bacterial strains that are difficult to grow under standard culture conditions, detection of proximal SIBO only, and potential for sample contamination.[6,7]

SUMMARY

SIBO and SIFO are increasingly recognized as common causes of unexplained abdominal bloating, gas, distension, belching, and diarrhea. However, they are poorly recognized because of a lack of standardized diagnostic methods. Although noninvasive breath tests are often used as the first step in SIBO diagnosis, they either lack sensitivity or specificity and require further standardization and validation. Small-bowel aspirate/culture is generally accepted as the best diagnostic method, but it is invasive and is performed if symptoms are recurrent or refectory. Importantly, there is inadequate knowledge regarding the tools needed, the use of aseptic technique, and a standardized technique for collecting the small-bowel juice. Here, we describe our method of performing small-bowel aspiration to facilitate an optimal diagnosis of SIBO or SIFO (Video 1).

DISCLOSURES

All authors disclosed no financial relationships.

Abbreviations: SIBO, small-intestinal bacterial overgrowth; SIFO, small-intestinal fungal overgrowth.

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https://doi.org/10.1016/j.vgie.2020.11.008