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Case Report

Nausea, Bloating and Abdominal Pain in the Roux-en-Y Gastric Bypass Patient: More Questions than Answers

G. Anton Decker, MBBCh, MRCP[1]; John K. DiBaise, MD[1]; Jonathan A. Leighton, MD[1]; James M. Swain, MD[2]; Michael D. Crowell, PhD[1]

[1]Division of Gastroenterology and Hepatology and [2]Department of Surgery, Mayo Clinic, Scottsdale, AZ, USA

Bariatric surgery is the most effective treatment for severe obesity. After surgery, patients may complain of gastrointestinal symptoms but their altered anatomy can make investigations difficult to perform or interpret. In particular, the Roux-en-Y gastric bypass (RYGBP) creates an excluded segment that is not easily accessible. We present a case illustrating some of the difficulties encountered when investigating the RYGBP patient complaining of nonspecific GI symptoms. Options are discussed for examining the excluded segment, and the diagnosis and significance of small intestine bacterial overgrowth in the RYGBP patient is reviewed.

Key words: Bloating, abdominal pain, bariatric surgery, obesity, double balloon endoscopy, bacteria

Introduction

Non-specific nausea, bloating and abdominal pain can be a difficult diagnostic problem after Roux-en-Y gastric bypass (RYGBP). The most appropriate investigations to perform and how to interpret the results require careful consideration. Knowledge of the surgical anatomy is essential, and a multidisciplinary approach is encouraged.

Correspondence to: G. Anton Decker, MBBCh, MRCP, Assistant Professor of Medicine, Division of Gastroenterology and Hepatology, Mayo Clinic, 13400 East Shea Blvd., Scottsdale, AZ 85259, USA. E-mail: decker.anton@mayo.edu

Case Report

In 2002, a 42-year-old woman weighing 142 kg (BMI 51.9 kg/m^2) had undergone an open retrocolic-retrogastric divided RYGBP using a circular 21-mm EEA stapler, for medically complicated obesity at an outside institution. The Roux limb was 90 cm in length. Nine months postoperatively, she developed nausea, episodic vomiting, bloating and constant right upper quadrant abdominal pain.

Esophagogastroduodenoscopy (EGD) examination was normal. In 2004, because of persistent symptoms and the presence of gallstones, she underwent an open cholecystectomy. An exploration during the operation did not reveal any other cause for her symptoms.

In October 2006, she presented to our institution still complaining of nausea, abdominal bloating and right upper quadrant pain. Her vomiting had spontaneously resolved and she was able to eat most food without difficulty. She weighed 76.1 kg (BMI 28.4 kg/m^2). On examination of her abdomen, mild tenderness in the right upper quadrant was noted. No organomegaly, masses or abdominal bruits were found.

Her laboratory profile showed a normal hemoglobin and chemistry panel except for a mildly decreased albumin at 3.2 g/dl (normal 3.4-4.7). A computed tomography (CT) enterography scan showed diffuse, mildly thickened and dilated (2-3 cm) small bowel loops. There was no evidence of small bowel obstruction. A glucose hydrogen breath test to evaluate small intestinal bacterial overgrowth demonstrated a significant increase in breath hydrogen from 2 ppm at base-

line to 111 ppm at 120 minutes (abnormal is defined as an increase in breath hydrogen >20 ppm over baseline within 120 minutes of glucose ingestion). EGD demonstrated an appropriately sized gastric pouch and gastrojejunal anastomosis without ulceration. Push enteroscopy to the level of the jejunojejunostomy was then performed; however, the biliopancreatic limb could not be entered due to the distance and looping of the scope. An aspirate obtained via a sterile catheter passed through the endoscope and taken from the proximal Roux limb grew >100,000 colony-forming units (CFU)/ml of aerobes (normal defined as <100,000 CFU/ml). Mucosal biopsies taken from the Roux limb were normal histologically. The patient was treated for *small intestine bacterial overgrowth* (SIBO) with amoxicillin/clavulanate 875 mg orally every 12 hours for 10 days. There was no improvement in her symptoms, and the concern arose that her symptoms may be arising from the excluded stomach or the biliopancreatic limb of her RYGBP.

An antegrade peroral double balloon enteroscopy (DBE) was then performed under general anesthesia and the scope was successfully advanced to the level of the excluded stomach.[1] During insertion, aspirates were collected from the Roux limb, the area of the jejunojejunostomy and the biliopancreatic limb and were immediately sent to the microbiology laboratory in three separate containers. The gastric mucosa in the excluded stomach appeared atrophic and mucosal biopsies showed mild chronic gastritis without *Helicobacter pylori*. The aspirates from the jejunojejunostomy and biliopancreatic limb each grew >100,000 aerobic CFU/ml; however, the aspirate taken from the Roux limb did not meet diagnostic criteria for bacterial overgrowth. Repeat antibiotic treatment for SIBO was recommended, but the patient declined and requested a surgical referral.

The patient continues to experience the same symptoms, and thus far declines another exploratory laparotomy.

Discussion

This case illustrates two management challenges in patients with GI symptoms following RYGBP. First is the concern that there may be pathology in the excluded segment, an area that is inaccessible by standard radiological and endoscopic examination. Second is the clinical relevance of SIBO and how to interpret the diagnostic tests.

Inspecting the Excluded Segment

The RYGBP creates a portion of the stomach and small bowel (biliopancreatic limb) that are not accessible by standard EGD. While push enteroscopy may allow inspection as far as the jejunojunostomy, it is unlikely to allow visualization of the entire biliopancreatic limb or excluded stomach.[1,2] A barium radiograph is also unable to evaluate the excluded segment, because this portion is out of the continuity of barium flow. Similarly, although a CT scan of the abdomen provides cross-sectional imaging and may diagnose a distended excluded segment, more subtle obstructive findings or mucosal pathology may be missed. Until recently, the only other methods to inspect these areas was to create a surgical gastrostomy in order to gain endoscopic access to the excluded segment[3,4] or to perform intraoperative endoscopy.

The recent introduction of DBE, first described by Yamamoto et al in 2001,[5] now allows direct visualization as well as diagnostic and therapeutic intervention of the entire small bowel. The technique for advancement uses a push-and-pull method with inflation and deflation of the balloons and telescoping of the intestine onto an overtube (Figures 1-5). This plication of the small bowel over the overtube allows the enteroscope to be inserted much further than the length of the enteroscope itself. DBE can be used to access the biliopancreatic limb and excluded stomach after RYGBP.[1,6] The technique has also been used for a percutaneous endoscopic gastrostomy tube placement in the excluded stomach[7] and to facilitate endoscopic retrograde cholangiopancreaticogram after RYGBP.[8] Although not yet widely available, DBE should be considered as a diagnostic and therapeutic tool after RYGBP when there is a concern of pathology in the excluded segment.

Small Intestine Bacterial Overgrowth (SIBO) after RYGBP

The healthy human proximal gut contains up to 10^4 viable organisms (gram-positive aerobes and facultative anaerobes) per milliliter of jejunal juice.[9]

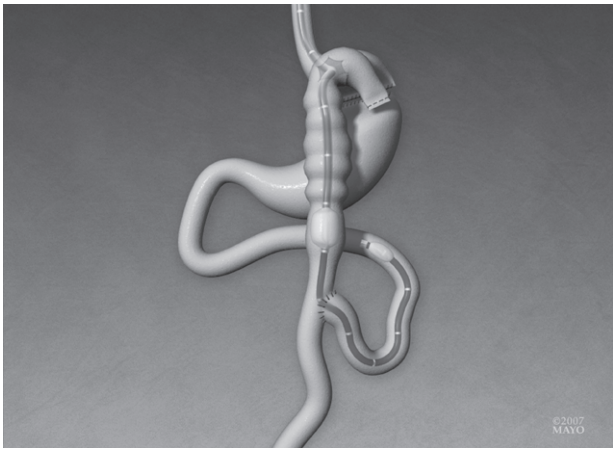

Figure 1. DBE step 1. The overtube is fixed by the inflated balloon and the enteroscope with the deflated balloon is advanced. (Figures 1-5 used with permission of Mayo Foundation for Medical Education and Research)

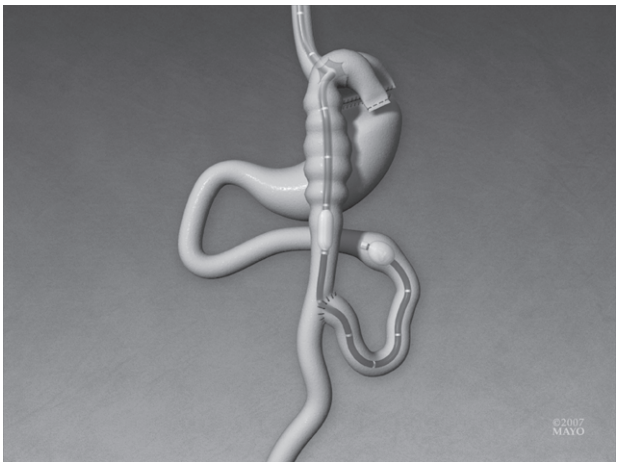

Figure 2. DBE step 2. The balloon on the enteroscope is inflated and the balloon on the overtube is deflated.

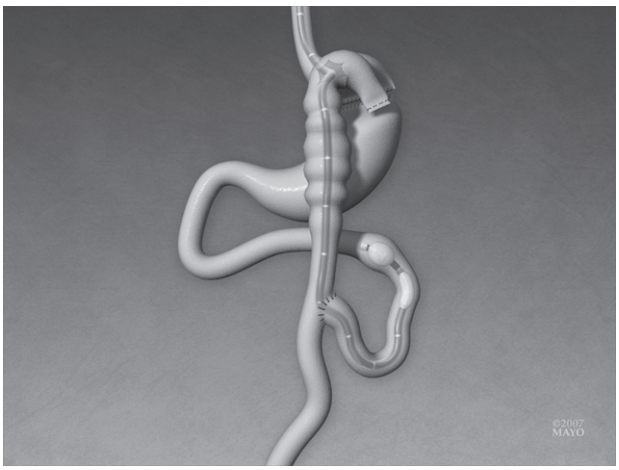

Figure 3. DBE step 3. The enteroscope is fixed by the inflated balloon and the overtube is advanced to the level of enteroscope balloon.

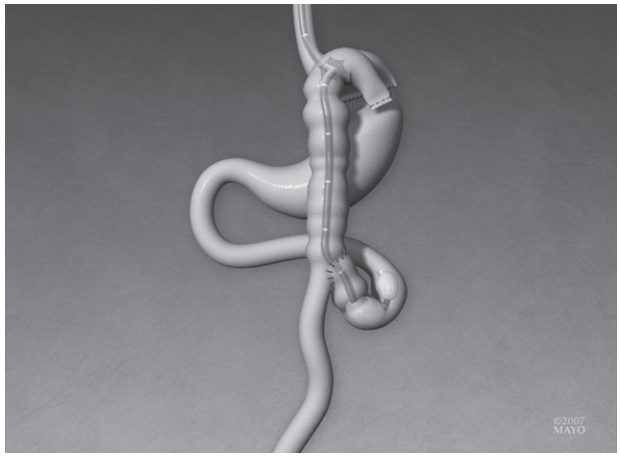

Figure 4. DBE step 4. The balloons on the enteroscope and the overtube are inflated before both tubes are pulled back, thereby plicating the small bowel over the overtube.

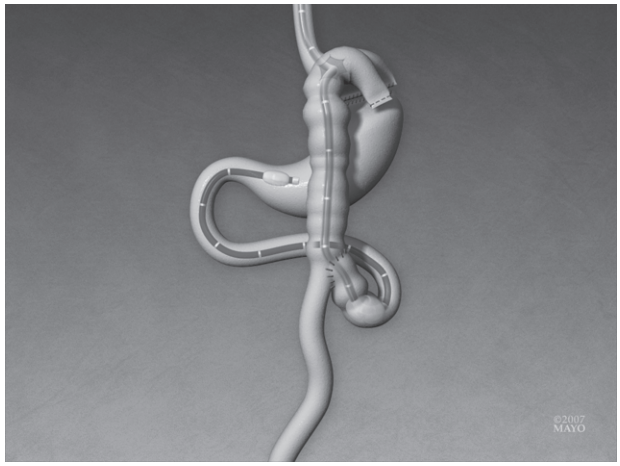

Figure 5. DBE step 5. The balloon on overtube is kept inflated while that on the enteroscope is deflated. The enteroscope is advanced again. (Scale and length of Roux limb do not represent exact anatomy)

SIBO is a syndrome that may cause diarrhea, abdominal bloating, malabsorption and anemia. Predisposing factors for developing SIBO include a reduction in gastric acid (e.g. proton pump inhibitors[10] or a post-gastrectomy state[11]), delayed intestinal transit (e.g. diabetes or scleroderma[12]) or surgery resulting in a blind loop.[13] The "gold standard" for diagnosis is the finding of more than 10^5 organisms per milliliter of jejunal juice obtained via a sterile catheter at the time of endoscopy.[14] The diagnosis can also be made by non-invasive means using a hydrogen breath test. The hydrogen breath test[15] is based on the principle that bacteria are the sole source of gut hydrogen. The abnormal production of hydrogen following ingestion of a sugar sub-

strate (e.g., glucose or lactulose), usually defined as a rise in end expiratory breath hydrogen of >20 ppm above baseline, suggests the presence of SIBO.

After RYGBP, patients may develop persistent diarrhea, bloating, weight loss, anemia, and malabsorption. While these symptoms might all be consistent with SIBO, they are non-specific and the syndrome has not been well described after RYGBP. The frequency of SIBO in patients after RYGBP and its role as the cause of symptoms is currently unknown. In a post total gastrectomy group of patients, Bragelmann did not find a difference in GI symptoms between patients with or without SIBO.[11] Furthermore, the interpretation of jejunal aspirates and hydrogen breath testing in patients after a RYGBP is not straightforward: the normal flora in the small bowel after a RYGBP is unknown and the most appropriate site for obtaining an aspirate is unclear. A standard upper endoscope would only allow sampling in the proximal portion of the Roux limb, whereas a push enteroscope or double balloon enteroscope would be required to obtain aspirates from the more distal Roux limb, the biliopancreatic limb or the common limb beyond the jejunojejunostomy. In the case described, DBE was used to obtain aspirates from the Roux limb, the area of the jejunojejunostomy and the biliopancreatic limb. Only the aspirates taken from the latter two sites, which would have been out of reach of a standard endoscope, had significant bacterial growth to meet criteria for SIBO.

Breath tests to diagnose SIBO are also problematic in the post-RYGBP patient. Rapid transit through the small bowel could result in the test substrate (glucose or lactulose) reaching the colon and initiating fermentation by colonic bacteria, leading to an early rise in breath hydrogen that might be falsely attributed to bacteria in the small bowel. Further study is needed to better understand how to interpret breath tests for SIBO in the RYGBP patient.

The case described raises several questions: was the failure to respond to the antibiotic because of bacterial resistance, because the antibiotic never reached the excluded segment, or because the SIBO was not responsible for the symptoms? In our experience, patients diagnosed with SIBO after RYGBP are more likely to respond to antibiotics when their predominant symptoms are bloating or diarrhea. When abdominal pain is the predominant symptom, they appear to be less likely to improve and SIBO may be an irrelevant finding.

A Roux stasis syndrome, consisting of chronic abdominal pain, nausea and vomiting, has been described in up to 30% of patients after Roux-en-Y reconstruction following partial gastrectomy.[16,17] Although the diagnostic criteria of the Roux stasis syndrome are vague and the pathophysiology is not understood, it is curious that the syndrome has not been described in the bariatric setting.[18]

The challenges encountered in the management of the case described highlight the importance of managing these complicated patients by a team that includes a surgeon and a gastroenterologist with a comprehensive knowledge of the altered anatomy and physiology and the spectrum of gastroenterological complications that may develop.

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