International Journal of Gastrointestinal Intervention

journal homepage: www.ijgii.org

Case Report

Percutaneous gastrostomy tube placement of the excluded gastric remnant after laparoscopic bariatric surgery in three patients

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ABSTRACT

Roux-en-Y gastric bypass (RYGB) is the most common bariatric surgery in the United States. RYGB is a successful and safe procedure that promotes weight loss, improves medical comorbidities and overall quality of life. Following RYGB, endoscopic access to the biliopancreatic limb and the excluded stomach is limited due to altered anatomy. Access to the excluded stomach may be needed for management of complications following RYGB as gastric remnant decompression due to biliopancreatic limb obstruction or nutritional support due to postoperative malnutrition. We report three cases of RYGB complications that necessitated percutaneous gastrostomy.

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Keywords: Enteral nutrition; Gastric bypass; Gastric stump

Introduction

Roux-en-Y gastric bypass (RYGB) is the most performed bariatric surgery in the United States.¹ The stomach is divided at the cardia with gastrojejunal anastomosis in the upper pouch and jejunojejunal anastomosis between Roux-en-Y and pancreaticobiliary limbs (Fig. 1). This results in the creation of an excluded stomach with limited endoscopic access. Multiple complications can arise such as bleeding, distention, leaks and perforation.^{2,3} When oral intake is poor or not possible after RYGB due to ulceration or stenosis at the gastrojejunostomy, access to the gastric remnant is important to provide adequate nutritional support.^{2,3} We report three cases with post RYGB complications that required percutaneous placement of gastric tube (Table 1).

Case Report

Case 1

A 48-year-old female underwent RYGB 6 years ago. Her starting body mass index (BMI) was 51.8 kg/m², now presented with significant malnutrition and BMI of 18 kg/m². No Ulcer or stricture was found on endoscopy. Feeding through percutaneous gastrostomy was needed. Computed tomography (CT) scan of the ab-

domen was performed without contrast media. A small window to the excluded portion of the stomach, between the left lobe of the liver and the splenic flexure colon was identified (Fig. 2A). Under fluoroscopic guidance a 21-gauge needle was inserted along the left lobe of the liver 50 mL of normal saline was injected in order to hydro-dissect the left lobe of the liver and the splenic flexure colon from the anterior margin of the excluded stomach (Fig. 2B). Air was then inflated into the stomach via the 21-gauge needle. Next, 3T-fasteners (Halyard Health, Alpharetta, GA, USA) were deployed in the anterior portion of the stomach and retracted. Under careful fluoroscopic guidance, a puncture was made into the stomach between the T-fasteners and the gastric position was confirmed with injection of air and contrast. A guidewire was inserted, and the tract carefully dilated to 16 French, followed by the placement of a 16 French MIC gastrostomy tube (Halyard Health) (Fig. 2C). Feeding was initiated two days after the tube placement. The patient gained up to 59.8 kg (from 51.2 kg) after initiating tube feeds. The patient's oral intake improved, and she was able to maintain body weight with oral intake. She also experienced some pain at the tube site, so gastric tube was removed after 4 months.

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Received December 22, 2020; Revised February 7, 2021; Accepted February 7, 2021

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Fig. 1. Schematic diagram of the gastrointestinal tract before (A) and after (B) roux-en-Y gastric bypass. Note that the newly formed gastric pouch (blue) is small to induce early satiety, and the bypassed biliary pancreatic small bowel limb (pink) decreases the surface area available for absorption. Note also that the excluded gastric remnant is no longer accessible by oral/antegrade route.

Table 1 Patients Presenting with RYGB Related Malnutrition Requiring Gastrostomy Tube Placement

Case no.	Age (yr)/sex	Indication	Sedation	Image guidance	T fastener Number/type	Gastric tube	Access maintained (mo)
1	48 / Female	Nutrition	IV moderate sedation (Versed/fentanyl)	CT fluoroscopy	3 SAF-T-PEXY T-fasteners (Halyard health)	16 French MIC gastrostomy feeding tube (Halyard health)	4
2	58 / Female	Nutrition	IV moderate sedation (Versed/fentanyl)	Ultrasound and CT guidance	3 SAF-T-PEXY T-fasteners (Halyard health)	15 French MIC gastrostomy feeding tube (Halyard health)	12
3	84 / Female	Nutrition	General anesthesia continuation following bronchoscopy	Ultrasound and CT guidance	3 SAF-T-PEXY T-fasteners (Halyard health)	16 French MIC gastrostomy feeding tube (Halyard health)	1

RYGB, roux-en-Y gastric bypass; IV, intravenous; CT, computed tomography.

Fig. 2. Axial abdominal computed tomography (CT) of 48-year-old female presenting with malnutrition 6 years after roux-en-Y gastric bypass. (A) Preprocedural CT shows small gastric remnant (hollow arrow) between left lobe of the liver and splenic flexure. (B) Injection of 50 mL of saline displaced the large bowel and CT guided placement of 21-gauge needle was possible which was used for gastric remnant inflation. (C) Percutaneous gastric tube was successfully placed.

Case 2

A 58-year-old female with history of RYGB presented with gastrointestinal bleeding from a chronic ulcer at the gastro-jejunosomy anastomotic site. Enteral feeding by percutaneous gastrostomy was needed. The patient had a complex surgical history including multiple exploratory laparotomies and a right colectomy with ileostomy creation. Recent computed tomogra-

phy angiogram demonstrates superficial position of the excluded stomach with a branch of the gastroduodenal artery looping superficial to the gastric remnant that appears in a strange anatomic location due to multiple surgeries (Fig. 3A). A 21-gauge Chiba needle (Cook medical, Bloomington, IN, USA) was used to access the excluded stomach with color ultrasound guidance to provide a safe access to the stomach and avoid the artery (Fig. 3B). Air was then inflated followed by contrast to confirm positioning un-

Fig. 3. A 58-year-old female patient with history of roux-en-Y gastric bypass referred for gastric tube placement in the gastric remnant. (A) Recent computed tomography (CT) angiogram showed superficial excluded stomach with a small arterial branch (white arrow) looping superficial to the gastric remnant. (B) Ultrasound guidance was used to place a 21-gauge Chiba needle while avoiding the arterial branch. (C) The position of the needle was confirmed by CT. (D) A 15 French gastrostomy tube was placed successfully.

Fig. 4. A 84-year-old female patient presenting with malnutrition post roux-en-Y gastric bypass. (A) A 21-gauge Chiba needle was advanced into the gastric remnant then it was subsequently distended with normal saline under ultrasound guidance. (B) 3T fasteners (white arrow) were placed and position was confirmed by computed tomography (CT). (C) A 16 French gastrostomy tube was successfully placed. (D) Contrast injected under fluoroscopy, confirming position of gastric tube within gastric remanence.

der CT (Fig. 3C). Under CT guidance a needle was advanced into the gastric lumen and 3T-tack fasteners deployed. The needle was then advanced between the T-tacks into the gastric lumen. A wire

was placed through the needle and then the needle was removed. After serial dilation of the tract, a 15 French MIC gastrostomy tube was placed. Tube feeds were initiated afterwards. Gastric tube

was used for feeds for approximately 12 months and the patient continued to need tube feeds due to persistent marginal ulcers at the anastomosis. Multiple abdominal CTs were done due to abdominal pain, showing adequate position of gastric tube (Fig. 3D). The Tube was pulled out and replaced twice after that.

Case 3

An 84-year-old female with history of RYGB 3 years ago presented with protein calorie malnutrition and non-intentional weight loss. Percutaneous feeding tube was needed for proper nutrition and the patient was transferred to our hospital for G tube placement in the excluded gastric remnant. Under ultrasound guidance a 21-gauge Chiba needle was advanced into the gastric remnant then it was subsequently distended with normal saline (Fig. 4A). 3T fasteners were placed under ultrasound guidance with the final placement confirmed with CT fluoroscopy (Fig. 4B). An 18-gauge needle was inserted adjacent to the T-fasteners, directed from left to right. A guidewire was then placed. The tract was sequentially dilated followed by insertion of a 16 French MIC gastric tube (Fig. 4C). The balloon was inflated, and contrast injected confirming the location of the gastric tube in the gastric remnant. There was filling of the gastric antrum and emptying into the duodenum (Fig. 4D). The Tube feeds were initiated the next day after tube placement. The tube remained in place for 30 days, then was replaced by another tube due to tube leakage. The replacement tube was used for 3 months then was accidentally dislodged and replaced by another one.

Discussion

We report the successful placement of percutaneous gastrostomy tubes in excluded stomach of post-RYGB patients. No complications were encountered in the three patients.

The gastric remnant is small measuring about 15 to 20 mL with difficult endoscopic access; therefore, percutaneous gastrostomy could be the only option to avoid laparoscopy or laparotomy. Gastric remnant is a blind pouch formed after RYGB that is difficult to access due to its location away from the abdominal wall, position under the liver, close relation with bowel or body habitus.

Imaging guided percutaneous gastrostomy tubes can help avoid surgical risks and general anesthesia. Placement of percutaneous gastrostomy tube in a patient with normal anatomy has a lower major complication rate of 5.9% with percutaneous gastrostomy versus 9.4% with percutaneous endoscopic gastrostomy.⁴ RYGB anatomy is a lot more technically challenging, however no significant increase in overall rate of major complications was evident in the few reported studies.⁵

Few data is available in interventional radiology literature about the techniques for the access of the excluded stomach.³ The type of imaging guidance utilized depends on pre-procedural imaging, anatomy and operator comfort. In cases of delayed gastric remnant emptying/biliopancreatic limb obstruction, pre-procedural imaging typically demonstrates a dilated gastric remnant, which may allow simple access using fluoroscopy alone. Identification of the decompressed stomach and providing access can be a lot harder.² A study by Majumdar et al⁶, used a combination of fluoroscopy and ultrasound guidance to access the excluded stomach. Fluoroscopy was used to identify the air-filled stomach and ultrasound was used to avoid injury of nearby structures. The use of fluoroscopy and ultrasound, helps in reducing radiation dose with CT. Inappropriate visualization of under distended

stomach by ultrasound and fluoroscopy mandates the use of CT guidance to allow safe access of the stomach.⁵

Delayed gastric remnant emptying and biliopancreatic limb obstruction may develop in the early or late postsurgical period. In the early postsurgical period, this may result from mechanical obstruction or ileus caused by internal hernia, adhesions, hemorrhage or edema at the entero-enterostomy. If this is left untreated, the resultant high intraluminal pressures may result in ischemia, anastomotic disruption with leak, or perforation.^{7–9} Findings of delayed gastric remnant emptying and biliopancreatic limb obstruction on CT scans include distention of the remnant stomach and biliopancreatic limb with occasional air fluid levels.^{10,11}

RYGB-related malnutrition is a late postsurgical complication (developing after months to years) and may be a result of chronic abdominal pain that causes chronic vomiting, stomal stenosis or ulceration. Stomal stenosis usually occurs at the gastrojejunal surgical anastomosis with an estimated incidence up to 27%, while marginal anastomotic ulcers can occur in up to 16% of patients.¹²

Enteral feeding through the excluded remnant is the preferred route for treating protein-calorie and vitamin deficiencies until oral intake is tolerated.

Percutaneous CT-guided gastrostomy tube placement should not be performed if an internal hernia, port site hernia, or ischemic bowel. Diagnostic laparoscopy should be performed emergently in such cases. Also, patients with worsening clinical examination findings or no improvement after percutaneous gastrostomy tube placement should undergo operative treatment.¹³

In conclusion, percutaneous gastrostomy tube placement of the excluded gastric remnant in a post RYGB patient is a convenient and safe route for enteral nutrition. As the population of patients with RYGB grows and ages, an increase in requests for gastrostomy tube placement in those patients is anticipated.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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