

## Prospective diagnosis of marginal ulceration following Roux-en-Y gastric bypass with computed tomography

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Marginal ulcers are reported to be the most common complication following Roux-en-Y gastric bypass surgery. Despite their frequency, they are rarely diagnosed prospectively with cross-sectional imaging. We present four cases in which the diagnosis of marginal ulceration was made prospectively with CT and confirmed with endoscopy.

### Introduction

Marginal ulcers have been reported as the most common complication following Roux-en-Y gastric bypass surgery (RYGB) occurring in as many as 16% of patients (1–13). Despite their relative frequency, they are difficult to diagnose prospectively on cross-sectional imaging.

We present four cases in which marginal ulceration was prospectively diagnosed on CT. Subsequent workup with endoscopy confirmed the diagnosis of marginal ulceration. To our knowledge, this is the first case series describing the imaging findings of marginal ulceration on computed tomography (CT) and serves as a reminder to look for this common complication on postoperative imaging performed on patients after RYGB.

### Case 1

A 51-year-old female presented for outpatient CT complaining of 2 weeks of left upper quadrant pain and melena. She was 6 years status post RYGB. Her postoperative course was complicated by a perforated ulcer requiring surgery 2 years after the bypass procedure and an anastomotic ulcer 4 years after bypass, which was healed at the time of followup endoscopy. Laboratory values included WBC of 5, Hct of 46, and Hg of 16. CT of the abdomen and pelvis with intravenous contrast (Fig. 1) revealed a



Fig. 1. Case 1. Axial image from IV-contrast-enhanced CT demonstrates a small ulceration along the medial aspect of the jejunum distal to the anastomosis.

**Citation:** Adduci AJ, Phillips CH, Harvin H. Prospective diagnosis of marginal ulceration following Roux-en-Y gastric bypass with computer tomography. *Radiology Case Reports*. (Online) 2015;10(2):1063

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**Competing Interests:** The authors have declared that no competing interests exist.

**Published:** June 28, 2015

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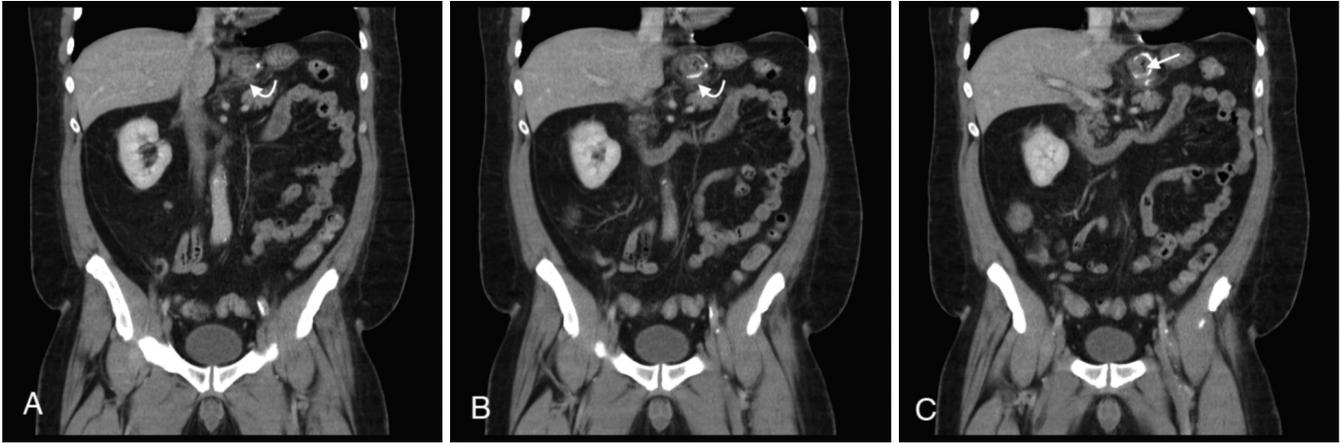


Fig. 2. Case 2. Selected coronal images demonstrate a small amount of stranding at the inferior aspect of the proximal jejunum near the anastomosis (A and B, curved arrow), and a more anterior image demonstrates a tiny ulceration inferiorly (C, straight arrow).

small ulceration along the medial aspect of the jejunum just distal to the gastrojejunal anastomosis. An esophagogastroduodenoscopy performed 2 days later confirmed the diagnosis of a small marginal ulceration with minimal oozing of blood from its margins.

### Case 2

A 62-year-old male presented to the emergency department complaining of generalized abdominal pain and melena. He was 7 months status post RYGB without known complication. Laboratory values included WBC of 5, Hct of 27, and Hg of 8.5. CT of the abdomen and pelvis with intravenous contrast (Fig. 2) revealed a small ulceration along the posterior aspect of the jejunum at the gastrojejunal anastomosis. An esophagogastroduodenoscopy performed later that day confirmed a deep ulceration just beyond the gastrojejunal anastomosis without active bleeding.

### Case 3

A 56-year-old female presented for outpatient imaging complaining of midabdominal pain for 3 months. She was 6 years status post RYGB without known complication. No laboratory testing results were provided. CT of the abdomen and pelvis with intravenous contrast (Fig. 3) was concerning for an ulceration along the anterior aspect of the jejunum just distal to the gastrojejunal anastomosis. A small volume of oral contrast was administered, and repeat imaging of the upper abdomen confirmed the diagnosis of marginal ulcer (Fig. 4). An esophagogastroduodenoscopy performed 7 days later also confirmed this diagnosis.

### Case 4

A 36-year-old male with history of diabetes presented to the emergency department with right upper quadrant pain that radiated to his back for 1 week. He was 16 months status post laparoscopic RYGB with a history of Peterson

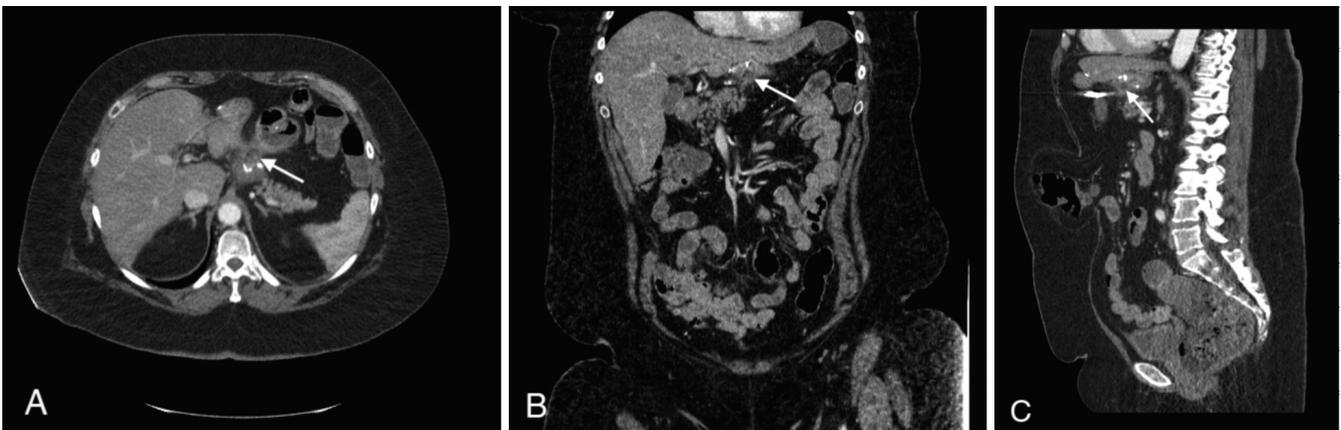
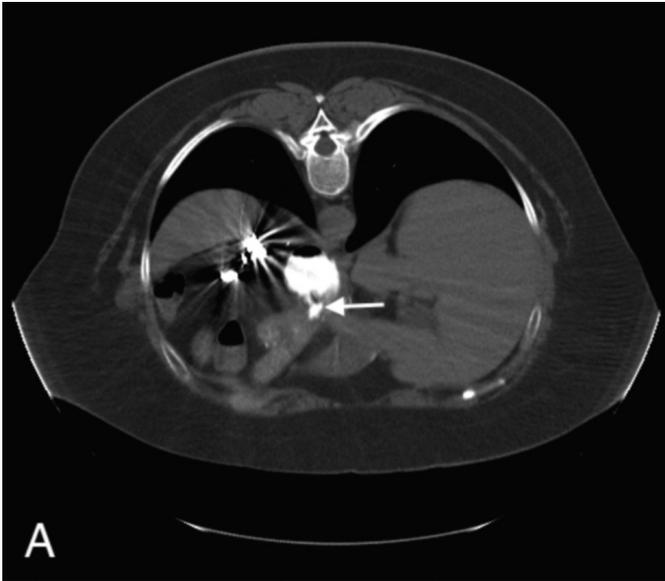


Fig. 3. Case 3. Axial (A), coronal (B), and sagittal (C) images of the G-J anastomosis demonstrate a small anterior outpouching with some adjacent ill-defined stranding (arrows).

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hernia repaired 5 months earlier. Laboratory values included WBC of 6.5, HCT of 41.5, and Hg of 14.5. CT of the abdomen and pelvis with intravenous and oral contrast (Fig. 5) was concerning for a marginal ulcer, including thickening of the proximal roux limb, adjacent stranding, dilation of the proximal gastric pouch, and contrast reflux into the esophagus. An esophagogastroduodenoscopy performed 1 day later (Fig. 6) confirmed the diagnosis of a 1.5cm marginal ulceration without active bleeding.

### Discussion

Obesity is a widespread problem in the United States, with over 35% of adults and almost 17% of children and



Fig. 5. Case 4. Axial images from IV and oral contrast-enhanced CT demonstrate wall thickening of the jejunum distal to the G-J anastomosis (A) with ulceration along its undersurface (B) and some adjacent stranding (C) (arrows).

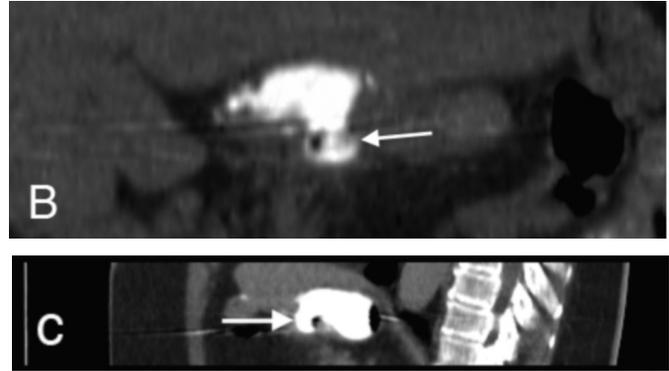


Fig. 4. Case 3. Axial (A) and magnified coronal (B) and sagittal (C) prone images following administration of positive oral contrast better demonstrate the small ulceration (arrows), now filling with contrast, and a small amount of adjacent stranding.



Fig. 6: Case 4. Endoscopic image from EGD performed the following day demonstrates a nonbleeding, 1.5cm, marginal ulceration located on the jejunal side of G-J anastomosis following administration of positive oral contrast better demonstrate the small ulceration (arrows), now filling with contrast, and a small amount of adjacent stranding.

adolescents meeting criteria for obesity (14, 15). RYGB remains the most common surgical treatment for morbid obesity, with nearly 50,000 surgeries performed each year in the United States and over 150,000 performed worldwide (16). Marginal ulcers have been reported at rates ranging from 0.6% to as high as 16%. This common and costly complication is best diagnosed with endoscopy. Such ulcers can lead to perforation (Fig. 7) or fistula formation (Fig. 8), and may require surgical revision. It has been estimated that 1% of RYGB patients will suffer from a perforated marginal ulcer (17, 18).

Marginal ulceration is felt to have a multifactorial etiology in RYGB patients. Various underlying conditions including small vessel ischemia, H. pylori infection, smoking, hypertension, diabetes, NSAID use, and sleep apnea have been linked to their formation (1, 9, 17, 19–23). They result in a number of presenting symptoms, with the most com-

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Fig. 7: Complications of marginal ulceration. Axial images from IV-enhanced CT examination from a different patient demonstrate ulceration of the proximal jejunum (straight arrow) at the G-J anastomosis with adjacent collection of gas (curved arrow) compatible with contained perforation.

mon being epigastric pain and vomiting (10, 24). Most marginal ulcers are diagnosed within two years of surgery, and most patients do well with medical management and followup (24). Given the incidence and importance of this entity, it is important to recognize the imaging features on cross-sectional imaging studies performed on RYGB patients.

To our knowledge, there are only three reported cases of ulceration following RYGB in the radiology literature. The two previous reports were of giant ulcers, and diagnosis was made with fluoroscopy (22, 25). We present the first four cases in which small marginal ulcers were diagnosed prospectively using CT. Subsequent endoscopy confirmed the diagnosis in all three cases. In one of the cases, positive oral contrast aided in the diagnosis of marginal ulceration. In

questionable cases, we recommend administering a cup of positive oral contrast on the CT table just before scanning. This may help to distend and fill the marginal ulcer, allowing for easier visualization. In our experience, a small amount of stranding at the gastrojejunostomy site may be the only CT sign of an underlying marginal ulcer. Such isolated stranding may be a reason for further evaluation of the patient with endoscopy. Multiplanar reformations can aid in the diagnosis and should be considered when evaluating patients with abdominal pain and prior RYGB. The ability of the radiologist to manipulate images using a thin-client 3D workstation at the time of interpretation may also help in diagnosis.

Perforation of marginal ulcers is more easily diagnosed if a focus of gas can be seen at the gastrojejunostomy site. This is less frequent, and the ultimate goal would be to diagnose and treat these patients well before progression to perforation.

Folds at the gastrojejunostomy site can mimic marginal ulcers. A lack of associated inflammation suggests that the finding is unlikely to be the cause of the patient's pain; the finding may reflect a healed ulceration or diverticulum, or a fold. Endoscopy may still be performed if the patient is experiencing epigastric pain of known etiology. Working closely with bariatric surgeons in all cases on gastric bypass patients results in helpful feedback to identify cases in which diagnosis may have been possible prospectively.

RYGB patients presenting to the emergency department with abdominal pain frequently require CT imaging to assess for emergent surgical diagnoses such as internal hernia, perforation, or leak. The diagnosis of marginal ulceration, a more common complication, should not be overlooked when interpreting CT in these patients. Given the difficulty of definitively diagnosing marginal ulceration with CT, it is not primarily indicated in diagnosis, but findings suggesting the diagnosis can explain patient pain and should prompt further evaluation with endoscopy.

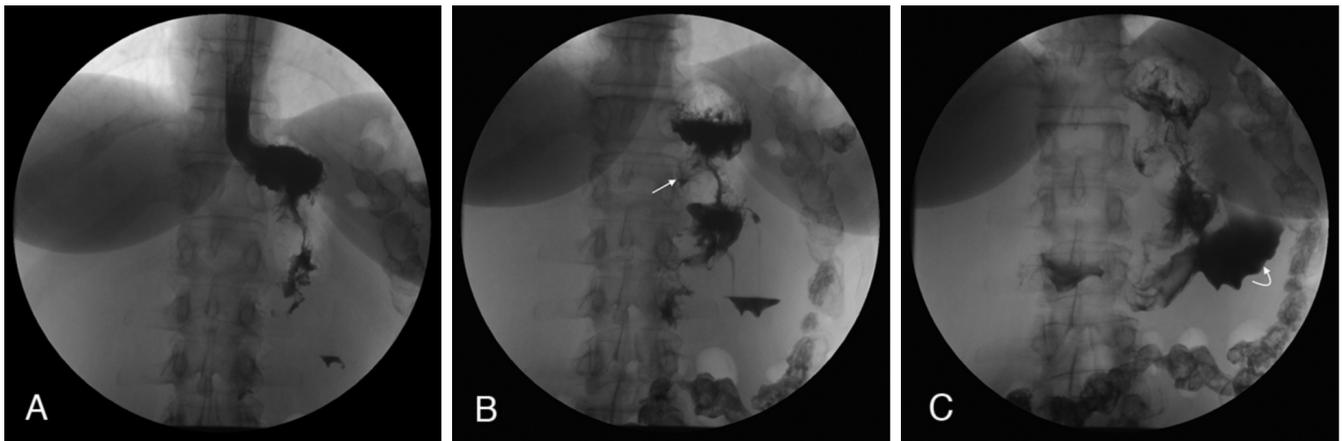


Fig. 8: Complications of marginal ulceration. Fluoroscopic images from the upper GI of a different patient demonstrate contrast passing readily from the esophagus, into the gastric remnant, though the gastrojejunal anastomosis, and into the alimentary limb (A). A fistula appears between the excluded stomach and the jejunal end of the gastrojejunostomy (B, arrow). Contrast accumulates in the excluded stomach (C, curved arrow).

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