Clinical Imaging 54 (2019) 159–162

Contents lists available at ScienceDirect

Clinical Imaging

journal homepage: www.elsevier.com/locate/clinimag

Body Imaging

Gastric remnant perforation in a gastric bypass patient secondary to splenic artery pseudoaneurysm: radiologic-surgical correlation

Kabir Suri, Khoa Tran, Gilbert Whang*

Department of Radiology, Keck School of Medicine of the University of Southern California, Los Angeles, California, United States of America

ARTICLE INFO

Keywords:
Roux-en-Y gastric bypass
Gastric remnant
Pseudoaneurysm
Postoperative complications
Gastric perforation
Hemorrhage

ABSTRACT

One of the more common effective surgical procedures performed today for obesity is the Roux-en-Y gastric bypass. Though effective, both early and late complications do occur. Gastric remnant hemorrhage after gastric bypass is an uncommon late complication, posing both diagnostic and therapeutic difficulties. We report a case of gastrointestinal bleed and gastric remnant rupture secondary to splenic artery pseudoaneurysm 14 years after initial bariatric surgery. Given altered surgical anatomy in gastric bypass procedures, diagnosis and treatment of the source of a gastrointestinal bleed in a Roux-en-Y gastric bypass patient may require a multimodality and multidisciplinary approach.

1. Introduction

Obesity has become exceedingly common in the United States and currently affects almost 40% of the population [1]. It is associated with some of the leading preventable causes of death such as stroke, type 2 diabetes, and heart disease. As such, bariatric surgery has become popular with two main approaches – bypass and restrictive procedures. Bypass procedures work by causing malabsorption and restrictive procedures work to decrease gastric volume, thereby inducing early satiety.

One of the more common surgical procedures performed is Roux-en-Y gastric bypass (RYGB), which combines both properties. Though effective, both early and late complications may occur including extraluminal leak, anastomotic stricture, marginal ulcers, small bowel obstruction, internal hernias, and ischemia [2]. Acute postoperative bleeding is uncommon with a 4.4% rate reported by Mehran [3]. Though rare, when it does occur, it can be fatal. Potential sites of bleeding include: the staple lines of the gastro-jejunostomy anastomosis, the site of the jejuno-jejujunostomy, the staple lines of the gastric remnant, and marginal ulceration [4,5]. Late bleeding from the biliopancreatic limb and gastric remnant is uncommon, mainly involving bleeding ulcers [6].

We report a case of a 67-year-old female who underwent RYGB 14 years before presentation to our institution for occult gastrointestinal bleed.

1.1. Case report

A 67-year-old obese female with a history of Roux-en-Y gastric bypass was transferred to our institution for balloon enteroscopy due to occult gastrointestinal bleed.

She originally presented to an outside hospital (1 month prior to admission to our institution) with acute onset abdominal pain, hematemesis, melena, dizziness, and chills. Her admission hemoglobin level was 9 g/dL. During her initial hospital stay, she underwent a battery of tests including an upper endoscopy, capsule endoscopy, colonoscopy, and computed tomography (CT) scans – all of which were negative for a source of active bleeding. CT of the abdomen was obtained 1 day after admission which demonstrated hemorrhage within the gastric remnant (Fig. 1) as well as extraluminal hemorrhage. A source for the gastrointestinal bleed was not identified. Over the course of her admission, she required 4 blood transfusions but was then ultimately discharged due to a stable hemoglobin value for > 48 h.

The patient was then readmitted one day after discharge with similar complaints as her initial admission. She initially had a conventional angiogram (not available) and though no active source of bleeding was seen, the gastroduodenal artery was embolized with absorbable gelatin powder. Follow-up noncontrast abdominal CT scans redemonstrated hemorrhage within the gastric remnant as well as extraluminal hemorrhage (not shown). An exploratory laparotomy was then performed which revealed old extraluminal hematoma but there was no visible bleeding from the gastric remnant. The patient was

* Corresponding author at: Department of Radiology, Keck Hospital of USC, 1500 San Pablo Street, 2nd Floor Imaging, Los Angeles, CA 90033, United States of America.
E-mail address: whangg@med.usc.edu (G. Whang).

https://doi.org/10.1016/j.clinimag.2019.01.006
Received 9 October 2018; Received in revised form 1 December 2018; Accepted 7 January 2019

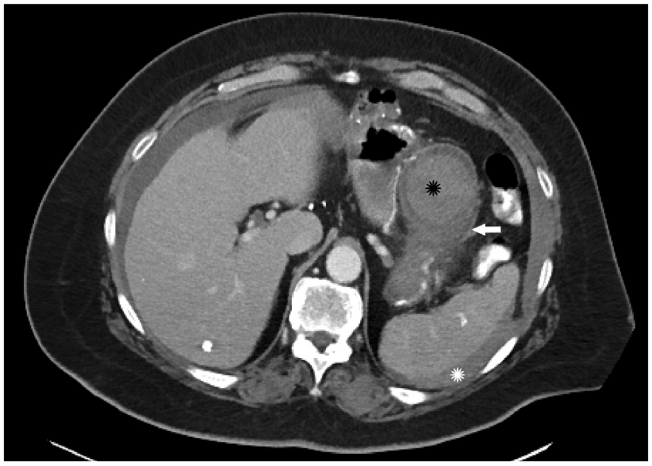

Fig. 1. Outside institution transaxial contrast-enhanced CT section (5 mm) of the abdomen revealed hemorrhage (black asterisk) in the gastric remnant (arrow) as well as extraluminal hyperdense fluid (white asterisk) surrounding the spleen, suggestive of hemorrhage in the left upper quadrant.

subsequently transferred to our institution for higher level of care.

Upon presentation to our institution, the patient was fatigued but denied nausea, vomiting, dizziness. Her physical exam revealed a moderately tender abdomen, with no rigidity or distention. Her hemoglobin level was 7.5 g/dL (normal range: 11.7 g/dL–15.7 g/dL).

Patient became hypotensive 2 days after admission and was transferred to the intensive care unit. Abdominal CT scan was performed later in the day which revealed hemorrhage in the gastric remnant as well as extraluminal hemorrhage in the left upper quadrant (Fig. 2). More inferiorly in the gastric remnant, a 5 × 5 × 6 mm splenic artery pseudoaneurysm projects into the stomach (Fig. 3). The small pseudoaneurysm was not diagnosed by the interpreting radiologist but can be seen retrospectively. Bedside esophagogastroduodenoscopy performed in the evening revealed a 2 cm ulcer in the gastric pouch along the gastrojejunal anastomosis as well as blood clots within the roux limb. The gastric remnant could not be evaluated. Double balloon enteroscopy, performed the next day, showed a large clot with fresh blood in the gastric remnant in addition to 2 nonbleeding ulcers. Due to the size of the clot, only a small portion of the gastric remnant was evaluated.

The patient's hemoglobin continued to remain low despite multiple blood transfusions. CT angiography (CTA) of the abdomen was performed, revealing heterogeneous hyperdense material within the distended gastric remnant representing blood products as well as a 10 × 11 × 14 mm splenic artery pseudoaneurysm (Figs. 4–5).

Fig. 2. Transaxial contrast-enhanced CT section (2 mm) of the abdomen reveals hemorrhage (asterisk) within the gastric remnant (arrow), as well as pocket of extraluminal hemorrhage (arrowhead) adjacent to the gastric remnant.

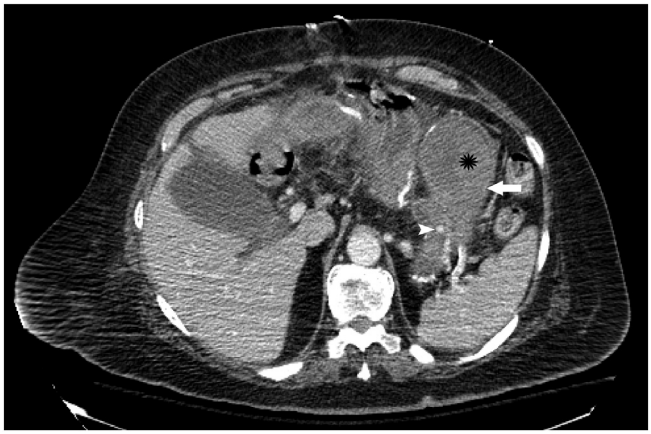

Fig. 3. Transaxial contrast-enhanced CT section (2 mm) of the abdomen reveals hemorrhage (asterisk) within the gastric remnant (arrow), in addition to a 5 × 5 × 6 mm splenic artery pseudoaneurysm (arrowhead).

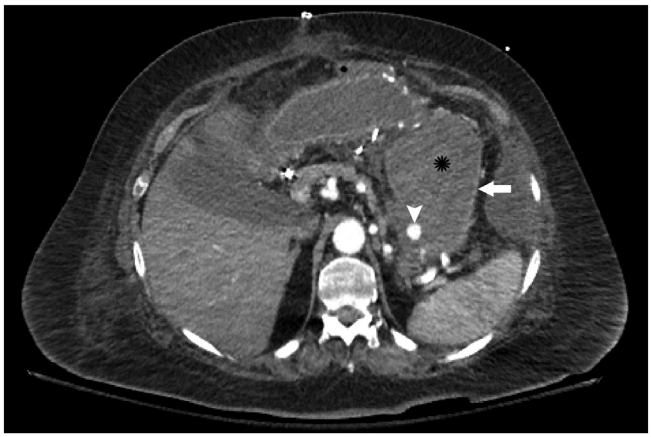

Fig. 4. Transaxial CTA section (3 mm) of the abdomen revealed increased hemorrhage (asterisk) within the gastric remnant (arrow) as well as increased size of splenic artery pseudoaneurysm measuring 10 × 11 × 14 mm (arrowhead).

Fig. 5. Coronal maximum intensity projection image from the CTA of the abdomen demonstrates splenic artery pseudoaneurysm (arrowhead) projecting into the stomach.

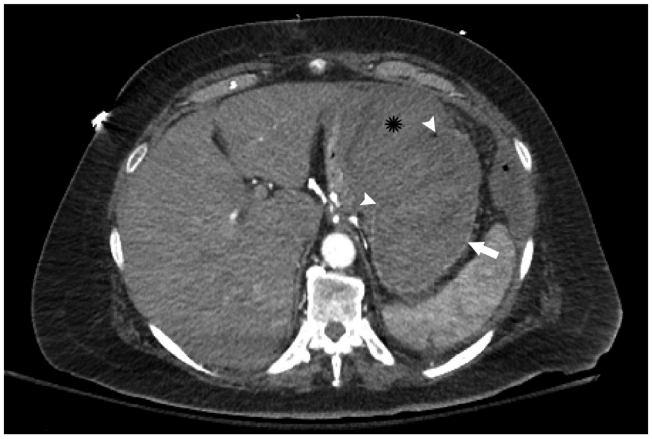

Fig. 6. Transaxial CTA section (3 mm) of the abdomen revealed hemorrhage within the gastric remnant (arrow) as well as increased extraluminal hemorrhagic fluid (asterisk). Discontinuity of the wall (arrowheads) is compatible with perforation of the gastric remnant.

Fig. 7. Spot image from conventional angiogram demonstrates embolization coils (arrowhead) within the splenic artery pseudoaneurysm.

Increased hyperdense hemorrhagic fluid was also identified in the left upper quadrant adjacent to the gastric remnant in addition to discontinuity of the gastric remnant wall, compatible with perforation (Fig. 6). The patient was initially treated with coil embolization of the splenic artery pseudoaneurysm (Fig. 7). The next day, the patient became septic and required an emergent exploratory laparotomy, which revealed a perforated gastric remnant, resulting in a large intra-abdominal abscess. The perforated segment was along the lesser curvature of the gastric remnant and was approximately 10 cm in length. Subtotal gastric remnant resection and splenectomy was performed. The patient had several post-operative fluid collections, which necessitated image-guided drainage, but she was eventually discharged after her pain was well controlled and she was hemodynamically stable and afebrile, roughly 3 weeks after admission to our institution. During the hospital stay, the consulting gastroenterologist was able to uncover a recent history of daily ibuprofen usage for 3 months after patient's hip replacement surgery from her daughter.

2. Discussion

Our case depicts a late complication of gastrointestinal hemorrhage due to gastric ulcers and splenic artery pseudoaneurysm formation. The accumulation of blood products over time from the gastric ulcers and splenic artery pseudoaneurysm distended the gastric remnant, subsequently leading to gastric remnant perforation. To our knowledge, our case is the first reported in the literature with radiologic-surgical correlation. The most common cause of upper gastrointestinal bleeding in patients who have previously undergone gastric bypass is marginal ulceration at the gastrojejunostomy, usually secondary to cigarette smoking or nonsteroidal anti-inflammatory drug (NSAID) use. Gastric remnant ulcer resulting in bleeding is rare. Human and animal studies have shown that the gastric pouch has decreased acid production whereas the gastric remnant maintains preoperative levels of acid production [7]. We postulate that the patient's daily NSAID usage led to the development of gastric ulcers which eroded through the wall and induced formation of a splenic artery pseudoaneurysm. Recent manuscripts have described massive gastrointestinal bleeding from splenic artery pseudoaneurysms caused by penetrating gastric ulcers [8,9] such as in our case.

This case highlights the difficulty in management of gastrointestinal bleeding in patients who have undergone Roux-en-Y gastric bypass surgery due to altered surgical anatomy. Treatment of the gastrointestinal bleed will depend on the source and site of bleeding and may be possible at the same time of diagnosis. However, diagnosing and treating a bleed from the gastric remnant may be delayed given difficult access via traditional endoscopy. One study suggests that if balloon enteroscopy is not available or is unsuccessful, a percutaneous gastrostomy tube can be placed within the gastric remnant and be used as a site of entry for an endoscope [10]. However, this may not have been successful in our case due to the large intraluminal hematoma within the gastric remnant. Patients may need to be transferred to facilities that can perform balloon enteroscopy. Upon review of the case, the initial angiogram showed no active bleeding and prophylactic absorbable gelatin powder embolization was employed. However, the patient continued to bleed. One interventional radiology study suggests the importance of implementing techniques during angiogram to encourage active bleeding, thereby increasing the sensitivity and utility of the study. These include high-pressure angiography or administration of heparin [11]. Such a maneuver may have helped facilitate the diagnosis on the outside conventional angiogram.

Diagnosis and treatment of the source of an occult gastrointestinal bleed in a Roux-en-Y gastric bypass patient may require a multimodality and multidisciplinary approach. In our case, the initial outside institution abdominal CT did not show the splenic artery pseudoaneurysm. In retrospect, the beginning of a tiny pseudoaneurysm may have been present and in evolution (Fig. 8). Also in our case, one of our

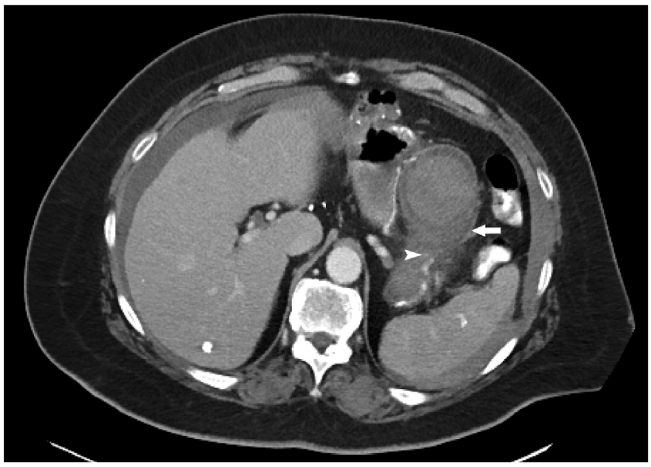

Fig. 8. Outside institution transaxial contrast-enhanced CT section (5 mm) of the abdomen in retrospect reveals a tiny focus of enhancement (arrowhead) which may have represented the beginnings of splenic artery pseudoaneurysm formation within the gastric remnant (arrow).

interpreting radiologists did not identify the 6 mm splenic artery pseudoaneurysm on the conventional CT scan. Noninvasive CT angiography studies should be performed to localize a source of bleeding when initial diagnostic tests are negative. It is vital that splenic artery pseudoaneurysms are promptly diagnosed as the mortality rate approaches 90% if left untreated [12]. The risk of rupture of pseudoaneurysms can range up to 37–47% of cases [12]. Given the high risk of splenic artery pseudoaneurysm rupture and high mortality rate from a rupture, earliest possible intervention using noninvasive radiological techniques and even surgery may be necessary [9]. Knowledge and recognition of this rare but important late complication of gastric bypass patients will facilitate early diagnosis and treatment, thereby minimizing morbidity and mortality.

Funding

None.

Conflicts of interest

The authors declare that they have no conflict of interest.

Human and animal rights statement

This article does not contain any studies with animals performed by any of the author(s). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was waived by our institutional review board.

Acknowledgements

None.

References

[1] English WJ, Williams DB. Metabolic and bariatric surgery: an effective treatment option for obesity and cardiovascular disease. Prog Cardiovasc Dis 2018;61:253–69.
[2] Levine MS, Carucci LR. Imaging of bariatric surgery: normal anatomy and postoperative complications. Radiology 2014;270:327–41.
[3] Mehran A, Szomstein S, Zundel N, Rosenthal R. Management of acute bleeding after laparoscopic Roux-en-Y gastric bypass. Obes Surg 2003;13:842–7.
[4] Nguyen NT, Rivers R, Wolfe BM. Early gastrointestinal hemorrhage after laparoscopic gastric bypass. Obes Surg 2003;13:62–5.
[5] Sapala JA, Wood MH, Sapala MA, Flake Jr. TM. Marginal ulcer after gastric bypass: a prospective 3-year study of 173 patients. Obes Surg 1998;8:505–16.
[6] Patrascu S, Ponz CB, Ananin SF, Soler EMT. A delayed acute complication of bariatric surgery: gastric remnant haemorrhagic ulcer after Roux-en-Y gastric bypass. J Minim Access Surg 2018;14:68–70.
[7] Eid JJ, Radecke JM, Murr MM. Gastrointestinal bleeding from the excluded stomach: a proposed algorithmic approach to management. Surg Obes Relat Dis 2015;11:e11–4.
[8] Pasumarthy L, Kumar RR, Srour J, Ahlbrandt D. Penetration of gastric ulcer into the splenic artery: a rare complication. Gastroenterol Res 2009;2:350–2.
[9] Sawicki M, Marlicz W, Czapla N, Łokaj M, Skoczylas MM, Donotek M, et al. Massive upper gastrointestinal bleeding from a splenic artery pseudoaneurysm caused by a penetrating gastric ulcer: case report and review of literature. Pol J Radiol 2015;80:384–7.
[10] Braley SC, Nguyen NT, Wolfe BM. Late gastrointestinal hemorrhage after gastric bypass. Obes Surg 2002;12:404–7.
[11] Kim CY, Suhocki PV, Miller Jr. MJ, Khan M, Janus G, Smith TP. Provocative mesenteric angiography for lower gastrointestinal hemorrhage: results from a single-institution study. J Vasc Interv Radiol 2010;21:477–83.
[12] Tessier DJ, Stone WM, Fowl RJ, Abbas MA, Andrews JC, Bower TC, et al. Clinical features and management of splenic artery pseudoaneurysm: case series and cumulative review of literature. J Vasc Surg 2003;38:969–74.