

Importance of CT in Evaluating Internal Hernias after Roux-en-Y Gastric Bypass Surgery

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ABSTRACT

As the incidence of obesity increases, laparoscopic Roux-en-Y gastric bypass (REYGB) surgery has become a surgical option for many patients. Although the laparoscopic Roux-en Y procedure has been shown to reduce weight and improve diabetes, hyperlipidemia, hypertension and sleep apnea, it is not without significant risks, as more than 10% of patients who undergo this procedure have postoperative GI complications. This is a case of a 51 year old man who presented with diffuse abdominal pain one month status-post Roux-en-Y gastric bypass. CT imaging proved to be crucial in the diagnosis of this pathology with small bowel volvulus and ischemia. We review some key CT findings that can aid clinicians in diagnosing internal hernias since this complication is often misdiagnosed and have a mortality rate of more than 50%.

CASE REPORT

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A 51-year-old obese man who is one-month status-post Roux-en-Y gastric bypass presented to the Emergency Department with a chief complaint of acute, diffuse abdominal pain of five hours duration accompanied by nausea and eight episodes of non-bilious, non-bloody vomiting that started immediately after eating lunch. The pain was described as sharp and constant in nature without radiation and 8 out of 10 in severity. He stated that he had never experienced symptoms like this prior to or after his gastric bypass. The patient had his last normal bowel movement on the morning of presentation. He was currently on a Stage IV diet due to his gastric bypass, consisting of strictly pureed or soft foods. He had no

significant history of alcohol, tobacco, or illicit drug use. He denied chest pain, shortness of breath, fever, chills, or diarrhea. His past medical history was remarkable for obesity, hypertension, and dyslipidemia.

On physical examination in the Emergency Department, the patient was an obese man in moderate distress. He was tachypneic and afebrile, but other vital signs were within normal limits. Skin was found to be pale, cold, and clammy. Systemic examination was unremarkable. The patient's abdominal exam revealed a soft, obese, non-distended abdomen with diffuse tenderness without any rebound tenderness or guarding. The patient had scars from his previous abdominal surgery, but no palpable masses or organomegaly, no fluid wave, no Rovsing's, obturator, or

iliopsoas sign, and no Murphy's sign. Blood work obtained in the Emergency Department showed an elevated total bilirubin and AST at 2.2 and 39 respectively. Amylase, lipase, and CBC were all within normal limits. Urinalysis showed clear, yellow urine without evidence of a UTI. An EKG showed normal sinus rhythm without evidence of ischemic changes.

The patient's history and physical was suggestive of a small bowel obstruction. An upright abdominal radiograph was obtained (Fig. 1), which did not show free air. There were scattered air fluid levels with question of fullness in the mid abdomen. Chest films were normal.

CT of the abdomen and pelvis with IV and oral contrast was obtained to rule out small bowel obstruction. Patient did not tolerate the oral contrast and the study was performed with limited ingestion of oral contrast. The CT scan demonstrated postoperative changes from Roux-en-Y gastric bypass, as well as contrast in the colon attributable to previous imaging studies conducted after his initial operation. There were markedly dilated small bowel loops, up to 3.4 cm, in the mid abdomen (Fig. 2). In addition, there was a collapsed segment of small bowel in the mid abdomen with twisting of the mesenteric vessels suggestive of a closed loop obstruction, adjacent to three suture lines (Fig. 3,4). The distal ileum was collapsed. There was associated mesenteric edema with small amount of fluid in the abdomen. Twisting of mesentery was also noted. There was evidence of segmental bowel wall thickening with adjacent fluid suggestive of early ischemic changes. The remnant stomach was found to be filled with debris due to distal obstruction (Fig. 4). No free air was identified. The solid organs were unremarkable, with the exception of multiple scattered low density well circumscribed foci in the liver most likely to be simple cysts.

The patient was then taken to the operating room for urgent exploratory laparotomy. Intraoperatively, the patient was found to have the majority of his small bowel herniated through a defect in the mesentery below the jejunojejunostomy with associated torsion. The herniated loops of small bowel were dark purple and appeared ischemic. A segment of jejunum just distal to the jejunojejunostomy was acting as a tight bowstring at the root of the internal hernia. This strangulating band of bowel was quickly divided. After detorsion of the volvulus and reduction of the hernia, the appearance of the bowel slowly improved. Hand held Doppler was used to confirm that the entire length of small bowel regained circulation and was viable. A side-to-side enteroenterostomy was performed to reconnect the Roux-En-Y limbs to the remaining small bowel. A gastrostomy was placed to help decompress the remnant massively distended stomach. On hospital day 8, the patient had a Gastrografin study via his G-tube and orally that showed prompt passage of contrast into the jejunum. The patient was discharged three days later.

DISCUSSION

Obesity is a major worldwide problem that affects millions of people. In the United States, 23.9% of adults were obese (BMI of 30 or more) in 2005 (1). An additional 4.8% were considered morbidly obese (BMI of 40 or more). Obesity is associated with major health problems including coronary heart disease, hypertension, diabetes, hyperlipidemia, and

sleep apnea (1). More than \$100 billion is spent annually in the United States on obesity and related medical conditions (1). Many patients fail conservative management and turn to surgical options which have proven to be very effective. A recent meta-analysis investigating the effects of bariatric surgery showed a mean excess weight loss in patients undergoing these procedures to be 61.2% (2). The most commonly preformed bariatric procedure in the United States is the Roux-en Y gastric bypass (3).

Although the laparoscopic Roux-En-Y procedure has been shown to reduce weight and improve diabetes, hyperlipidemia, hypertension and sleep apnea, it is not without significant risks, as more than 10% of patients who undergo this procedure have postoperative GI complications (1,4). One of the most serious risks is an internal hernia. Internal hernias have an overall incidence of less than 1% but constitute up to 5.8% of all small bowel obstructions (5). With the recent increase in liver transplantation and gastric bypass surgery, the incidence of internal hernias has increased, up to 2.8% of those undergoing Roux-En-Y gastric bypass go on to develop this complication (4,5). In Roux-En-Y gastric bypass patients, internal hernias can be found in three potential locations: the small bowel defect found at the jejunojejunostomy site, posterior to the Roux limb (Peterson type), and most commonly at the opening in the transverse mesocolon through which the Roux limb is connected to the newly formed gastric pouch (6). In addition to internal hernias, other complications of REYGB include anastomotic leak, anastomotic stricture, small bowel obstruction secondary to adhesions, and abscess formation.

Internal hernias have a mortality of more than 50% if strangulation of small bowel is present. They are often misdiagnosed on presentation. Therefore it is imperative that they are diagnosed promptly and treated correctly. Since the patients often present clinically with vague symptoms, or are even asymptomatic, imaging plays a crucial role in diagnosis. The most useful imaging modality for internal hernias is a CT which can show many classic features and can lead to early detection reducing the associated morbidity (6).

In a recent study by Lockhart et al, CT scans of 18 patients with surgically proven internal hernias were compared to CT scans of 18 patients who did not have an internal hernia (7). Both groups of patients had laparoscopic Roux-en Y gastric bypass procedures. This group identified seven key CT scan findings including swirled mesentery, mushroom sign, hurricane eye, small-bowel obstruction, clustered loops, small bowel behind superior mesenteric artery, and right-sided anastomosis. This group found that the single best predictor of hernia was swirled mesentery. The swirled mesentery and mushroom shape of the mesentery were better predictors of internal hernia than swirled mesentery alone. These findings in combination yielded a sensitivity of 73%, 83%, and 83% for three separate reviewers. The specificity was found to be 83%, 89% and 67%, respectively (7). In addition to these findings, another study found that no omental fat overlying clustered loops of bowel, engorgement and stretching of the mesenteric vessels, and central displacement of the transverse colon were also important CT findings (3). Furthermore, in patients with internal herniation of the small bowel mesentery, as occurred in this patient, the clustered bowel is typically seen pressed

against the abdominal wall leading to the colon being centrally displaced (4).

This patient's initial presentation and physical findings were suggestive of bowel obstruction and included a differential diagnosis of: obstruction from adhesions, obstruction from a large bolus of food, stricture at an anastomosis, in addition to internal hernia. CT imaging was vital in making the accurate diagnosis and thereby instituting the correct management in a timely fashion. Though this patient had many symptoms consistent with internal herniation, such as postprandial abdominal pain, nausea, and vomiting, findings on CT imaging proved crucial in the diagnosis of this pathology with small bowel volvulus and ischemia (8). The CT findings in this patient consisted of a closed loop small bowel obstruction, swirled and edematous mesenteric vessels, and clustered loops of small bowel with edematous bowel wall suggestive of associated bowel ischemia (Fig. 2, 5).

As obesity rates continue to increase, the number of patients undergoing elective Roux-En-Y gastric bypass for weight loss is likely to increase as well. The complications from this procedure can be life threatening, making their early diagnosis and management of critical importance. Because patients' physical exam presentations can be non-specific in terms of their underlying pathology, CT will remain a critical imaging modality to assess for these various complications and guide surgical interventions when appropriate.

TEACHING POINT

A major complication of Roux-En-Y gastric bypass surgery is internal hernia, which has a mortality rate of more than 50% and is often misdiagnosed. Key CT findings that can aid clinicians in diagnosing internal hernia include swirled mesentery, mushroom sign, hurricane eye, small-bowel obstruction, clustered loops, small bowel behind the superior mesenteric artery, and right-sided anastomosis.

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FIGURES



Figure 1: 51 year old male with closed loop bowel obstruction secondary to internal hernia. Upright Abdominal Radiograph: Scattered air fluid levels within non-dilated loops of small bowel question of a central mass.

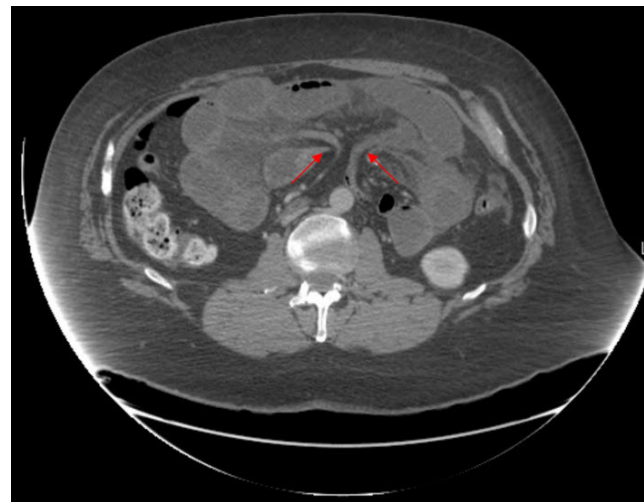


Figure 2: 51 year old male with closed loop bowel obstruction secondary to internal hernia. Axial CT slice demonstrating dilated loops of small bowel and left sided bowel wall thickening suggestive of ischemia. Note the positive "mushroom sign".

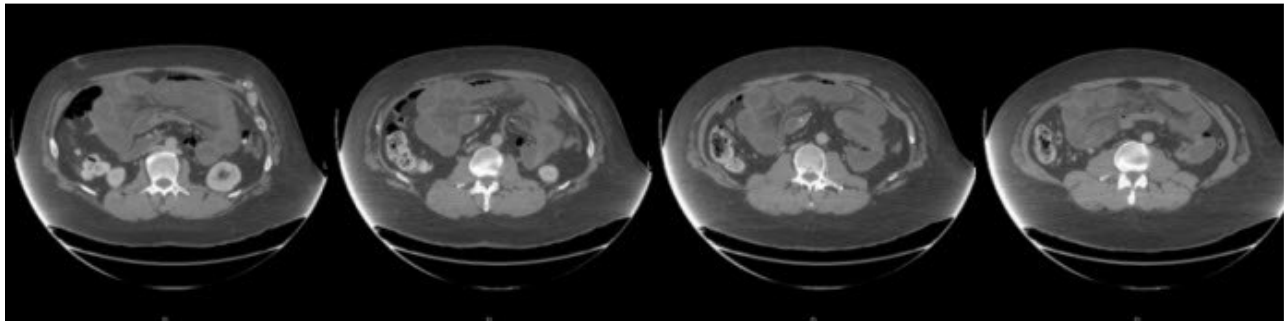


Figure 3: 51 year old male with closed loop bowel obstruction secondary to internal hernia. Axial CT series demonstrating the segment of decompressed bowel and "mushroom sign".



Figure 4: 51 year old male with closed loop bowel obstruction secondary to internal hernia. Mesenteric swirl seen on coronal CT suggesting internal hernia. Note the distended remnant stomach.



Figure 5: 51 year old male with closed loop bowel obstruction secondary to internal hernia. Coronal CT image demonstrating edema in the mesentery with associated bowel wall thickening suspicious for associated ischemia.

ABBREVIATIONS

REYBG = Roux-en-Y gastric bypass
CT = Computed tomography
KUB = Kidneys, ureter, and bladder

KEYWORDS

Roux-en-Y gastric bypass, Internal hernia

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