



Body Imaging

Gastrobronchial fistula after sleeve gastrectomy: clinical and radiographic findings[☆]Suehyb G. Alkhatib^a, Marc S. Levine^{b,*}^a Department of Radiology, Pennsylvania Hospital, Philadelphia, PA 19107, United States of America^b Department of Radiology, Hospital of the University of Pennsylvania, Philadelphia, PA 19104, United States of America

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ABSTRACT

We describe a patient who developed an intractable leak from the gastric sleeve after laparoscopic sleeve gastrectomy, resulting in the development of a gastrobronchial fistula. Affected individuals typically have a persistent leak from the gastric sleeve with recurrent subphrenic abscesses, and when a gastrobronchial fistula develops, these patients may present with paroxysms of coughing immediately after ingestion of solids or liquids. In the appropriate clinical setting, a barium study not only may show the leak, but also directly visualize the gastrobronchial fistula. If aggressive endoscopic dilation procedures and/or endoscopic placement of stents or clips fail to facilitate healing of the leak and fistula, these patients may require surgical intervention, with conversion of the sleeve to a Roux-en-Y gastric bypass or even a partial or total gastrectomy. The development of a gastrobronchial fistula after sleeve gastrectomy therefore can be extremely challenging to manage.

1. Introduction

Bariatric surgery is the most effective treatment option for obese patients who fail to achieve adequate weight loss by exercise and dietary modification [1]. While Roux-en-Y gastric bypass remains the most widely performed bariatric procedure worldwide, laparoscopic sleeve gastrectomy is rapidly becoming the favored weight loss procedure in developed countries [2]. Sleeve gastrectomy entails resection of a major portion of the greater curvature of the fundus and body of the stomach, resulting in the creation of a tubular gastric sleeve. Post-operative weight loss is promoted by the restrictive effect of the sleeve as well as surgical resection of ghrelin-producing cells, with decreased production of ghrelin (a hunger-inducing hormone) and subsequent appetite reduction. Sleeve gastrectomy is often the favored form of bariatric surgery because of its ability to produce substantial weight loss with fewer complications than Roux-en-Y gastric bypass [3,4].

Laparoscopic sleeve gastrectomy is associated with a variety of acute and chronic complications (such as sleeve leaks and stenoses) that are becoming more important to recognize as an increasing number of patients undergo this procedure [5,6]. One of the rarer complications of sleeve gastrectomy is the development of a gastrobronchial fistula, which has a reported incidence of 0.2–2.6% in the medical/surgical

literature [7,8]. Despite its rarity, gastrobronchial fistula can be a potentially life-threatening complication, so early diagnosis and appropriate treatment are paramount. To our knowledge, however, this complication has not been reported previously in the radiologic literature. We therefore present a patient who developed a gastrobronchial fistula after laparoscopic sleeve gastrectomy and discuss its significance.

2. Case report

A 60-year-old woman who underwent laparoscopic sleeve gastrectomy at an outside institution had a difficult postoperative course with repeated hospital admissions over a 2-year period because of a stricture at the proximal end of the sleeve requiring multiple dilations and the development of an intractable leak from the proximal end of the staple line, with recurrent subphrenic abscesses (Fig. 1A), left pleural effusions, and left lower lobe pneumonias. Because of this nonhealing leak, the patient underwent 8 months of total parenteral nutrition complicated by the development of *Candida* septicemia. She also underwent additional endoscopic procedures for placement of endoscopic clips to occlude the leak and covered metallic stents across the leak to facilitate leak closure. Despite these interventions, the patient had

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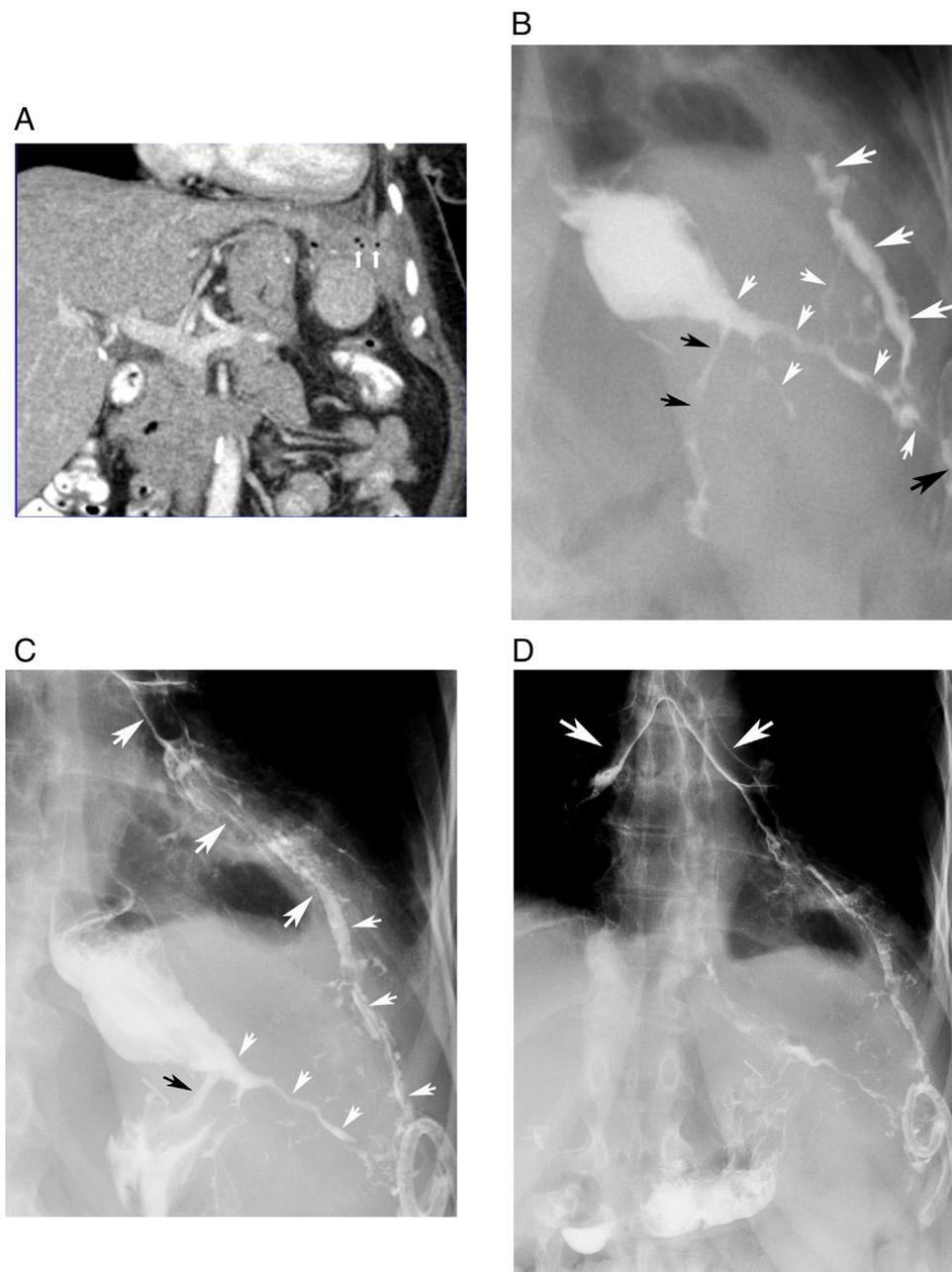


Fig. 1. Development of gastrobronchial fistula in 60-year-old woman with leak from proximal end of sleeve after sleeve gastrectomy.

A. Coronal image from an oral and IV contrast-enhanced abdominal CT scan during early portal venous phase shows gas (arrows) and fluid in a subphrenic abscess caused by a leak from the left lateral aspect of the proximal end of the gastric sleeve. (Note lower density of fluid compared to the adjacent spleen.)

B. Frontal spot image from a single-contrast barium study of the upper gastrointestinal tract 9 months later shows marked narrowing of the proximal end of the gastric sleeve (small black arrows), with upstream dilation of the stomach and a focal leak from the left lateral aspect of the sleeve just above the narrowed segment into a multiloculated extraluminal collection consisting of multiple thin tracks (small white arrows) and a single wider track extending superiorly towards the left hemidiaphragm (large white arrows). Note a small amount of barium in the region of the distal tip of the percutaneous drainage catheter (large black arrow).

C. Repeat frontal spot image from the same barium study moments later again shows marked narrowing of the proximal end of the sleeve (black arrow), with a focal leak into a discrete track extending laterally and then superiorly (small white arrows) across the diaphragm into the left lower thorax, where it communicates with a peripheral branch of the bronchial tree (large white arrows), producing a gastrobronchial fistula. Note reflux of barium into left lower lobe bronchus (uppermost large white arrow).

D. Lower magnification spot image from the same study after an episode of paroxysmal coughing shows regurgitation of barium into both lower lobe and main stem bronchi (arrows) and the distal end of the trachea. There also was rapid reflux of barium into the proximal trachea, larynx, and pharynx (not shown on this image).

difficulty tolerating oral feeding and recently developed episodes of paroxysmal coughing of ingested substances immediately after oral intake of solids and liquids.

A single-contrast upper gastrointestinal barium study revealed slow passage of barium into a markedly narrowed proximal gastric sleeve, with a persistent leak from the left lateral aspect of the proximal end of the sleeve into a contained extraluminal collection consisting of multiple tracks; the widest track extended superiorly into the left subphrenic space (Fig. 1B) and then transdiaphragmatically into the left lung base, where it communicated with a peripheral branch of a left lower lobe bronchus, producing a gastrobronchial fistula (Fig. 1C). Barium entering the airway immediately precipitated an episode of paroxysmal coughing, with forceful regurgitation of barium from the left lower lobe bronchial tree into both lower lobe and main stem bronchi (Fig. 1D) as well as the trachea, larynx, and pharynx.

The patient was admitted to our hospital for intensive nutritional support and management of her gastrobronchial fistula. The drainage catheter in her subphrenic abscess was replaced, and a percutaneous

feeding jejunostomy tube was placed at laparoscopy into her proximal small bowel. A decision was made by a multidisciplinary management team to discharge the patient on supplemental total enteral nutrition and antibiotics prior to planned surgical repair of her gastrobronchial fistula.

3. Discussion

Gastrobronchial fistula is a rare but well-recognized complication of thoracic and abdominal surgery, including splenectomy, esophagogastrectomy and gastric pull-through (with an intrathoracic stomach), and, rarely, other forms of gastric surgery, such as a Nissen fundoplication [9,10]. Gastrobronchial fistula has also recently been recognized as a complication of bariatric surgery, particularly laparoscopic sleeve gastrectomy [7,8,11–14]. Affected individuals typically present with episodes of paroxysmal coughing of ingested solids or liquids immediately after oral intake, intermittent fevers, and recurrent pneumonias [8,12,14]. Paroxysmal coughing of ingested solids or liquids therefore

should raise concern about the possibility of a gastrobronchial fistula after sleeve gastrectomy.

As in our case, most patients with gastrobronchial fistulas after laparoscopic sleeve gastrectomy are found to have a persistent leak from the left lateral aspect of the proximal end of the sleeve into the left subphrenic space with recurrent subphrenic abscesses (Fig. 1A) [11,13]. These abscesses presumably lead to transdiaphragmatic extension of the inflammatory process into the left lung base, accounting for the development of the fistula. Because patients with subphrenic abscesses frequently are treated by placement of a percutaneous drain or catheter (either by a surgeon or interventional radiologist) for abscess drainage, it has been hypothesized that diaphragmatic injury by the drain or catheter may also play a role in the development of these fistulas [13].

There is little published data about the utility of various diagnostic tests for the detection of a gastrobronchial fistula after laparoscopic sleeve gastrectomy. Endoscopy may not reveal a leak or fistula involving the sleeve [13], and even if a leak or fistula is detected, communication with the tracheobronchial tree is unlikely to be recognized at endoscopy. In some patients with gastrobronchial fistulas, CT may reveal a subphrenic abscess or left lower lobe pneumonia [13], but in others, CT may show the actual site of the fistula, or the fistula may be recognized indirectly on CT by the presence of orally ingested contrast material in the bronchial tree.

As in our case, an upper gastrointestinal barium study not only may show an underlying leak from the gastric sleeve (Fig. 1B), but also direct passage of barium from the leak transdiaphragmatically into the bronchial tree at the left lung base, confirming the presence of a gastrobronchial fistula (Fig. 1C). Irritation of the airway by barium entering the bronchial tree may cause paroxysmal coughing, with rapid regurgitation of barium into both main stem bronchi (Fig. 1D) as well as the trachea, larynx, and pharynx. The barium study also is useful for excluding tracheobronchial aspiration as an alternative cause of the patient's symptoms. When a gastrobronchial fistula is suspected after sleeve gastrectomy, the fluoroscopic study should be performed with barium rather than a water-soluble iodinated contrast agent because of the potential risk of severe pulmonary edema when a water-soluble iodine-based contrast agent enters the lungs [15].

The diagnosis of a gastrobronchial fistula after sleeve gastrectomy is a potentially life-threatening condition because of the high frequency of recurrent pneumonias in these patients. Initial management includes intravenous antibiotics and drainage of an underlying subphrenic abscess. Other treatment options include endoscopic dilation of an area of sleeve stenosis at or near the site of leakage and placement of a covered metallic stent to facilitate closure of the leak and fistula [11]. Endoscopic clips and adhesive substances have also been deployed to occlude the leak and facilitate healing of the fistula, but such techniques are not always successful [11].

If nonsurgical management fails to promote healing of a gastrobronchial fistula, surgical take-down of the fistula with conversion of the gastric sleeve to a Roux-en-Y gastric bypass and even a partial or total gastrectomy have been reported for successful treatment of these

fistulas after sleeve gastrectomy [7,11]. Surgical intervention therefore may be required when noninvasive treatment options are unsuccessful.

4. Conclusion

We describe a patient who developed an intractable leak from the gastric sleeve after laparoscopic sleeve gastrectomy, resulting in the development of a gastrobronchial fistula. Affected individuals typically have a persistent leak from the gastric sleeve with recurrent subphrenic abscesses, and when a gastrobronchial fistula develops, these patients may present with paroxysms of coughing immediately after ingestion of solids or liquids. In the appropriate clinical setting, a barium study not only may show the leak, but also directly visualize the gastrobronchial fistula. If aggressive endoscopic dilation procedures and/or endoscopic placement of stents or clips fail to facilitate healing of the leak and fistula, these patients may require surgical intervention, with conversion of the sleeve to a Roux-en-Y gastric bypass or even a partial or total gastrectomy. The development of a gastrobronchial fistula after sleeve gastrectomy therefore can be extremely challenging to manage.

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