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## Bougie insertion: A common practice with underestimated dangers

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### ABSTRACT

**INTRODUCTION:** Esophageal perforation after bariatric operations is rare. We report two cases of esophageal perforation after bariatric operations indicating the dangers of a common practice – like insertion of esophageal tubes – and we describe our management of that complication.

**PRESENTATION OF CASE:** A 56 year old woman who underwent laparoscopic sleeve gastrectomy and a 41 year old woman who underwent laparoscopic adjustable gastric banding respectively. In both operations a bougie has been used and led to esophageal perforation.

**DISCUSSION:** The insertion of bougie and especially of inflated bougie is a common practice. It is an invasive procedure that in most cases is performed by the anesthesiologist team.

**CONCLUSION:** Bougie insertion is an invasive procedure with risks and should always be attempted under direct supervision of surgical team or should be inserted by a surgeon.

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### 1. Introduction

Esophageal perforation (EP) is the rupture of the esophagus, which is most common due to mechanical forces. Hermann Boerhaave first described EP in 1723, when he observed a spontaneous rupture of the esophagus occurring after repeated vomiting.<sup>1</sup> However, surgical repair was first attempted in 1947 by Barrett and Olson.<sup>1</sup> The incidence of EP is rising as a result of the wide application of endoscopy not only as a diagnostic but also as a therapeutic tool as well.<sup>1</sup>

Obesity is a major health care issue in many countries worldwide. The World Health Organization (WHO) estimates that by 2015 the obese population on earth will reach 700,000,000. As a result of the increasing obese population, bariatric procedures are becoming more popular and especially after the publication of encouraging long term results are considered the gold-standard in the treatment of morbid obesity in selected patients. Two of the most frequently used operations are laparoscopic sleeve gastrectomy (LSG) and laparoscopic adjustable gastric banding (LAGB). Both procedures are relatively safe and provide a high rate of weight loss and long-term results. One of the complications of these bariatric procedures described is the injury of the esophagus. To our knowledge esophageal perforation after LSG<sup>2</sup> and LAGB<sup>3</sup> has only been reported once and twice respectively.

Herein, we present two cases of esophageal perforation after LSG and LAGB respectively, that have both been managed with diversion cervical esophagostomy, in a two stage procedure.

### 2. Presentation of cases

#### 2.1. Case 1

A 56 year old white woman with a BMI of 44.5 kg/m<sup>2</sup> underwent a LSG for treatment of her morbid obesity. From her past medical history she had a laparoscopic cholecystectomy 4 years ago. She was on b-blockers for treatment of her high blood pressure for the last 3 years and on antidepressants for treatment of depression for the last 2 years. The patient was not a smoker and had a natural childbirth 24 years ago.

On the 5th postoperative day the patient complained of a mild discomfort and dyspnea. The patient's white blood count (WBC) and C-reactive protein (CRP) were elevated. Patient's chest X-ray presented an opacity of the left hemithorax. Heart ultrasound was normal. A computed tomography (CT) scan was conducted revealing free fluid, air-fluid level, atelectasis in the left hemithorax and gastrografin leak (see Fig. 1). Pleuritic fluid paracentesis revealed amylase of 25,200 u. On the 6th postoperative day the patient underwent an esophageal swallow study, which revealed leak of the contrast substance from the lower esophagus to the mediastinum.

The patient was then transferred to our hospital, where an emergency operation was decided. A midline laparotomy was performed and the lower esophagus was evaluated. A tear of the lower third of esophagus, above the gastroesophageal junction and an empyema of the left hemithorax and the mediastinum was identified. The left hemidiaphragm was widely opened and the empyema was drained through the abdomen. Two drainage tubes were placed on the left posterior and anterior hemithorax. Subsequently the stomach was resected from the esophagus to the duodenum. A feeding tube was placed into the duodenum. The esophagus was transected without being removed and both a cervical

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Fig. 1. CT scan revealing bilateral pleural effusions and gastrografin leak.

esophagostomy and a peripheral esophageal tube were placed. The abdominal wall was closed. The patient was admitted to the ICU under sedation, intubated and in stable condition. She received intravenously antibiotics. On the 5th postoperative day the patient was discharged from the ICU to the wards and continued antibiotics for 10 days. She tolerated enteral feedings to maximum nutritional support. She was discharged from our hospital on the 28th postoperative day.

## 2.2. Case 2

A 41 year old white woman with a BMI of 48 kg/m<sup>2</sup> was admitted for the treatment of her morbid obesity. From her past medical history she suffered from gastroesophageal reflux disease (GERD) and she was on treatment with omeprazole. The patient underwent a laparoscopic adjustable gastric band placement. The patient recovered easily and returned to her room. On the 1st postoperative day the patient had temperature of 37.4 °C, she was tachycardic (100–120 pulses/min), complained of left pleuritic pain and had oxygen saturation of 92%. Patient's chest X-ray revealed atelectasis of the left lower lung lobe. On the 2nd postoperative day patient's chest and abdominal computed tomography (CT) revealed free air at the mediastenum, excessive consolidation and atelectasis of left lower lung lobe, pleuritic fluid in both hemithoraces and leak of gastrografin from the middle esophagus. The patient was urgently explored and she underwent a diagnostic right posterolateral thoracotomy. A rupture of the middle esophagus combined with severe mediastinitis was identified (see Fig. 2). The mediastinal fluid was drained and extended debridement were conducted. Two drainage tubes were placed at the left hemithorax. A total esophagectomy was decided (see Fig. 3). An abdominal incision was made and the esophagus was abstracted through the diaphragm. A feeding gastrostomy was placed. The upper esophagus was diverted at the neck as a cervical esophagostomy. During the operation the patient was transfused with 2 units of red packed cells. She was then admitted at the ICU intubated and under sedation. The patient's condition was critical throughout her stay in the ICU. She was in a septic shock and developed multiple organ failure. The patient died 18 days after her ICU admission.

## 3. Discussion

The most common cause of EP (60%) is the iatrogenic perforation due to endoscopic interventions such as esophagogastrosopy, pneumatic dilation for treatment of achalasia, dilation of strictures,

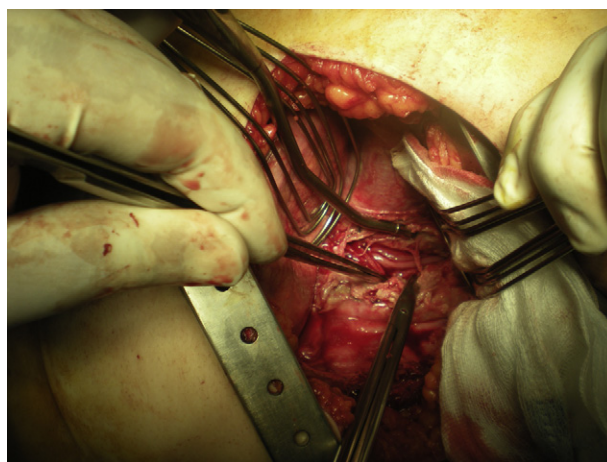


Fig. 2. Transthoracic approach of esophagus pointing the esophageal rupture.

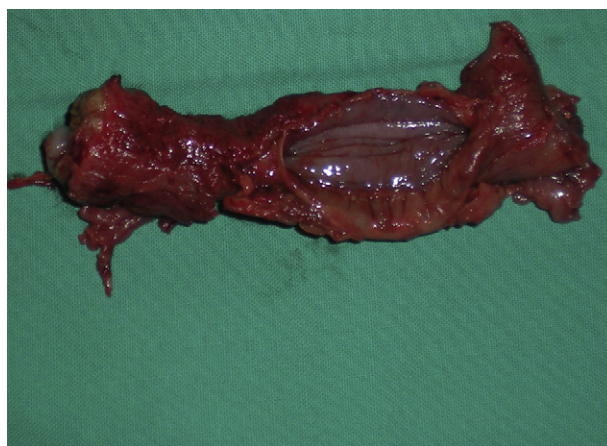


Fig. 3. Specimen of esophageal resection.

endosonography, sclerotherapy or endoscopic retrograde cholangiopancreatography (ERCP). Other causes can be intraoperative injury (7% of myotomies for achalasia, 3.9% of antireflux operations and 3.5% of osteosynthesis after cervical spine fracture) and rarely due to difficult endotracheal intubation, implantation of a aortic stent, insertion of nasogastric tube or Blakemore tubes.<sup>1,4</sup> Spontaneous perforation is known as Boerhaave's syndrome. It represents 8–56% of EP.<sup>1</sup> Boerhaave's syndrome is a traumatic rupture of the lower third of esophagus due to increased gastric pressure during vigorous vomiting combined with absence of relaxation of the superior sphincter of esophagus.<sup>1</sup> Traumatic non-iatrogenic perforations is a rare cause of EP. It can occur after blunt trauma (road accident, Heimlich maneuver), after caustic burn or after foreign body ingestion which is responsible for 80% of cervical perforations.<sup>1,4,5</sup> Not rarely EP can occur due to an underlying esophageal condition such as esophageal cancer (EP complicates 5–8% of patients with esophageal cancer treated with palliative treatment), esophageal diverticulum, Barrett's esophagus or esophagitis.<sup>1</sup>

The clinical presentation can widely vary due to the position of the organ into the posterior mediastenum. This makes early diagnosis difficult. About 60% of EPs are diagnosed in more than 24 h from the onset.<sup>1</sup> The clinical presentation differs according to the perforation's location. Perforation of the cervical esophagus presents commonly with subcutaneous emphysema (95%), cervical pain (90%), dysphagia, dysphonia and fever.<sup>1</sup> Perforation of the thoracic esophagus presents commonly with vomiting (84%),

thoracic pain (79%), dyspnea (53%), epigastric pain (47%) and dysphagia (21%).<sup>1</sup> Perforation of the abdominal esophagus presents with acute abdomen signs (rigidity, guarding) and mediastinal or pleural signs.<sup>1</sup>

The diagnostic workup includes plain cervical or chest X-ray films, which can reveal pleural effusion, pneumo- or hydropneumothorax, pneumomediastinum, subcutaneous emphysema and/or pneumoperitoneum. 90% of chest X-rays are abnormal in EP.<sup>1</sup> Cervical, thoracic and abdominal CT, have a sensitivity of 92–100%<sup>1</sup> and are part of the investigation process as well. Upper gastrointestinal swallow study with water soluble contrast, has a 50% sensitivity for the detection of cervical perforation and 75–80% sensitivity for the detection of the thoracic perforation, proving information about the location of the perforation and the magnitude of the leak.<sup>1</sup>

The mortality rate of EP is high, sometimes higher than 20% and can reach up to 80%, depending on the etiology, the location of the perforation and the time between the onset and the treatment.<sup>1,4,5</sup> The early diagnosis and the optimal therapeutic approach diminish the mortality rate. The fundamental principles in the management of EP is aggressive drainage and debridement of the mediastinum, diversion of the esophagus and the leak and an enterostomy for enteral feedings. Anastomosis should be performed with extreme caution only in patients with minimal contamination, stable condition and early after the perforation.

The surgical management of the morbid obesity is becoming popular among surgeons. These operations have more benefits than complications. The LAGB was first described in early 1980s, but it did not come into extensive use until 1993 when the first adjustable band was placed laparoscopically.<sup>6</sup> It is the bariatric operation with the lowest mortality (0.05–0.4%).<sup>6</sup> It is appealing to both, the patient and the surgeon, due to the minimally invasive surgical technique, the possibility to adjust the band and its possible reversibility. The short-term complications are rare (visceral injury 1%, gastrointestinal perforation 1%), though the long-term complications are common and include: the dislocation of the band (20–25%), dilation of the esophagus (8%) and septic infection or other incidences (pain, displacement) of the port (7%).<sup>6</sup>

LSG was initially conceived as a component of biliopancreatic diversion and duodenal switch. With the advance of the technology and the initiation of laparoscopic surgery, LSG has been used as a step operation in order to achieve a lower body mass index and reduce the mortality and morbidity of the definite weight loss surgery. However, nowadays LSG is used as a standalone operation.<sup>7</sup> Mortality is  $0.2 \pm 0.9\%$ .<sup>7</sup> The commonest short-term complications include staple-line leak (0.9%) and hemorrhage (1.1%).<sup>7</sup> As for long-term complication stenosis occurs in 0.9% and gastroesophageal reflux occurs in 22% of the patients during the first postoperative year, decreasing at 3% at the third postoperative year.<sup>7</sup>

Esophageal perforation is a possible but rare complication of bariatric procedures, mostly related with the intraoperative use of esophageal tubes. In the band procedure many surgeons use a special tube in order to size the placement of the band. This tube usually carries a balloon that is inflated in the stomach and pulled up to the gastroesophageal junction. The band is placed immediately lower to the inflated balloon. In the LSG there is an esophageal dilator which is usually 32 Fr and is placed into the stomach. The gastrectomy is performed over this tube, a maneuver that protects the patient from excessive gastrectomy and stenosis.

We present two rare cases of patients undergoing bariatric procedures for treatment of their morbid obesity both complicated by esophageal perforation. In both cases the bougie was inserted by the anesthesiologist team. We suspect that both patients had injuries related to the use of esophageal tubes as described earlier.

In both our patients because of late presentation we followed the plan of drainage, debridement, diversion and enteral feeding. The late admission of the first patient to our hospital made the final treatment of the EP more demanding. The cervical esophagostomy combined with preservation of the esophagus was considered to be the best choice for the first patient considering that the morbidity and mortality rates of a total esophagectomy in an unstable patient would be very high. The patient recovered successfully and a reconstructive operation has been arranged. Unlike the first patient, although the rapid identification and treatment of the EP, the second patient did not recover from the septic shock and eventually expired from multiorgan failure.

#### 4. Conclusion

The use of esophageal tubes during morbid obesity surgery should be done with extreme caution by the surgical team. When an injury occurs there should be high index of suspicion. All available tests, plain films, CT scan and swallow studies, should be done without delay. The surgical management depends on the patient condition and the local inflammation. Diversion should be done liberally and debridement and drainage must be very aggressive. This approach will give the patient the best chance for survival and reconstruction and reconstruction can be done electively at a later time.

#### Conflict of interest

The authors declare that they have no competing interests.

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None.

#### Ethical approval

Written informed consent was obtained from the first patient and from the relatives of the second patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

#### Author contribution

TD has made substantial contributions to conception and design of the paper, has been involved in patients' operation, in drafting the manuscript and revising it critically for important intellectual content; DG has been involved in acquisition of data and writing of the paper; LA has been involved in writing and critically revising the paper; AK has made substantial contributions to conception and design of the paper and has been involved in patients' operation; SK has made substantial contributions to conception and design of the paper and has been involved in patients' operation; ZG has given final approval of the version to be published; ME has made substantial contributions to conception and design of the paper, has been involved in patients' operation and has given final approval of the version to be published.

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