Case Report

Emergency Laparoscopic Repair of an Iatrogenic Gastric Perforation in a Hiatal Hernia following a Failed Endoscopic Closure

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Iatrogenic gastrointestinal perforation is a rare, life-threatening complication of endoscopic procedures, which requires either endoscopic or surgical repair. We report the account of an 82-year-old woman with an iatrogenic gastric perforation of a hiatal hernia secondary to an endoscopic retrograde cholangiopancreatography (ERCP) procedure. Despite immediate recognition of the complication and endoscopic closure with through-the-scope (TTS) clips, the patient developed mediastinitis, peritonitis, and sepsis. She subsequently underwent an emergency laparoscopic hiatal hernia dissection and repair of the perforation with mediastinal and peritoneal washout. Given the patient’s age and the degree of insult, subdiaphragmatic anchoring with abdominal drain placement was performed, and the hiatus was left open for additional drainage. The use of a side-viewing duodenoscope with the presence of a large hiatal hernia contributed to the risk of gastric perforation. We conclude that performing endoscopic procedures in patients with a known hiatal hernia should be carefully undertaken. If a perforation in such patients occurs, laparoscopic repair of such complications is feasible as demonstrated in this case video.

1. Introduction

Endoscopy is a safe and effective treatment modality for a variety of gastrointestinal disorders, with a complication rate of <1% and a mortality of <0.01% [1]. Among the possible complications of endoscopy is visceral perforation or tear along the surveilled portion of the gastrointestinal tract, which may occur due to overinsufflation or puncture from the endoscope or endoscopic instruments. Not all endoscopies are equal with regard to perforation risk, with some patients carrying a much higher chance of suffering this complication. Such patients are typically older, are admitted to a hospital, and have comorbidities such as active inflammatory bowel disease, COPD, malignancy, or concomitant steroid use. Additionally, small bowel enteroscopy places patients at a higher risk of perforation [2, 3].

Repair of full-thickness perforations is necessary to prevent contamination of the peritoneal cavity with subsequent peritonitis and sepsis. Such repair has traditionally been operative, though procedural management with through-the-scope (TTS) clipping has recently come to the fore as a viable, proven option [4]. In addition to definitive closure of the defect, patients must be serially surveilled, with a low threshold to pursue additional salvage operations. Other considerations for management should include a switch to carbon dioxide insufflation and decompression of pneumoperitoneum [5]. In this report, we present the case of a patient who suffered a gastric perforation during endoscopic retrograde cholangiopancreatography (ERCP). Initial management with TTS clipping failed in this instance, requiring operative intervention.
2. Case Report

An 82-year-old woman presented as a transfer from an outside facility with painless, obstructive jaundice. She observed yellowing of her skin, poor appetite, and fatigue for two days, as well as dark brown urine. She was otherwise healthy and independent at home. She did not smoke and had no family history of malignancy.

Diagnostic workup at the outside facility was notable for elevated total bilirubin to 14.4 mg/dL, alkaline phosphatase to 1,004 U/L, and white blood cell count was elevated at 23.6 × 10^9/μL. Magnetic resonance cholangiopancreatography (MRCP) had shown intra- and extrahepatic biliary dilation with evidence of a stricture in the distal common bile duct (CBD) suggestive of a pancreatic head mass. It also revealed the presence of a large, type III hiatal hernia, which had been previously asymptomatic other than mild reflux disease.

Given the concern for cholangitis, the patient was taken for an endoscopic ultrasound with subsequent ERCP to further evaluate her pathology and relieve her biliary obstruction. Endoscopy confirmed the presence of a large, type III hiatal hernia, which made advancing the endoscope into the duodenum difficult. The endoscopists were still able to proceed with ultrasound and were successful in identifying and obtaining biopsies of a mass in the pancreatic head. However, ERCP was aborted as the scope could not be advanced past the second portion of the duodenum. As the scope was being removed from the stomach, a small, linear tear was noted in the stomach mucosa along the greater curvature of the fundus, though the endoscopist believed it to be a partial-thickness tear. This was closed with serially placed 5 mm endoscopic clips, and complete approximation of the mucosa was seen.

The patient was subsequently placed on IV antibiotics and closely observed. Unfortunately, she progressed to develop signs of mediastinitis, peritonitis, and sepsis. The endoscopists were still able to enter the upper GI tract, nonoperative management was attempted, and whether carbon dioxide or air was used should be sure to document the size and location of the tear, whether endoscopic treatment was feasible and/or conservative, this injury pattern has a mortality that approaches 20% and thus warrants diligent surveillance [1]. When encountering a perforation, the endoscopist should be sure to document the size and location of the tear, whether endoscopic treatment was feasible and/or attempted, and whether carbon dioxide or air was used for insufflation. Nonoperative management is possible in select patients. In one series of 77 patients with perforation secondary to upper endoscopy, nonoperative management was attempted in half, though the failure rate for nonoperative management was 18% (TTS clips were not attempted) [6]. Esophageal injuries in this series were more likely to be able to accomplish nonoperative management, perhaps because of the availability of endoscopically placed stents to occlude perforations. In perforations that are not amenable to stenting, treatment by TTS clips has been shown to be safe and effective, decreasing the failure rate of nonoperative management to as low as 5% [7, 8]. Alternative endoscopic approaches to the closure of perforations have included endoscopic suture placement.

Iatrogenic perforation during endoscopy has an incidence of about 0.001% in retrospective reviews, with injuries occurring throughout the GI tract. There are both physiologic and anatomic risk factors for perforation. Physiologic risk factors include markers for systemic inflammatory states such as active inflammatory bowel disease, COPD, steroid use, increased age, or inpatient hospital admission. Anatomic risk factors include diverticula, malignancy, or small bowel enteroscopy [2, 3]. With upper endoscopy in particular, roughly half of perforations occur in the esophagus, frequently associated with dilatory procedures. The next most common site of perforation is the duodenum, with far fewer perforations occurring in the stomach, jejunum, and bile ducts [6]. In addition to the risk factors already discussed, risk for perforation on upper endoscopy can be increased in the presence of anatomic anomalies of the upper GI tract, such as anterior cervical osteophytes, Zenker’s diverticula, esophageal strictures, and malignancies [1]. This particular injury was attributable to the patient’s large, hiatal hernia, as well as the use of the side-view endoscope necessary for ERCP.

Though perforations from endoscopy may be managed conservatively, this injury pattern has a mortality that approaches 20% and thus warrants diligent surveillance [1]. When encountering a perforation, the endoscopist should be sure to document the size and location of the tear, whether endoscopic treatment was feasible and/or attempted, and whether carbon dioxide or air was used for insufflation. Nonoperative management is possible in select patients. In one series of 77 patients with perforation secondary to upper endoscopy, nonoperative management was attempted in half, though the failure rate for nonoperative management was 18% (TTS clips were not attempted) [6]. Esophageal injuries in this series were more likely to be able to accomplish nonoperative management, perhaps because of the availability of endoscopically placed stents to occlude perforations. In perforations that are not amenable to stenting, treatment by TTS clips has been shown to be safe and effective, decreasing the failure rate of nonoperative management to as low as 5% [7, 8]. Alternative endoscopic approaches to the closure of perforations have included endoscopic suture placement.
with Apollo Endostitch or the use of covered stents, as mentioned above. TTS clip placement likely failed in this case because the tear was in the herniated portion of the stomach and subjected to increased gastric pressure from distal obstruction at the crura.

This case also demonstrates the feasibility of laparoscopic repair for iatrogenic gastric perforation, even in cases where the repairs are anatomically complex and the patient’s disease is extensive. Though TTS clipping failed in this case, such closures should be attempted in all cases.

Figure 1: CT scan showing intra-abdominal and mediastinal free air and extraluminal contrast from the patient’s gastric perforation. (a) Coronal view. (b) Axial view.
of iatrogenic endoscopic perforation where the anatomy is favorable. Subdiaphragmatic anchoring with gastrostomy, gastropexy, and drainage was an effective and safe approach in this case, as closure of the hiatus would have risked having undrained contamination in the mediastinum. Laparoscopic repairs of this complexity require familiarity with minimally invasive equipment and techniques. In the absence of specialty care, an open approach may be more appropriate.

**Conflicts of Interest**

The authors declare that they have no conflicts of interest.

**Supplementary Materials**

Supplemental Video: narrated video of the surgical intervention. The patient underwent a laparoscopic dissection and reduction of her hiatal hernia with repair of her gastric perforation and abdominal and mediastinal washout. *(Supplementary Materials)*

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**Figure 2:** A still from the intraoperative video showing the perforation along the greater curvature of the fundus.