

# Esophagogastroduodenoscopy

CORE | January 06, 2025 | Kevin Records, MD • Sachin Kukreja, MD

## Learning Objectives

### 1. Indications and Contraindications

In a patient who has upper gastrointestinal (GI) complaints, determine whether esophagogastroduodenoscopy (EGD) should be performed.

- Indications
  - EGD is an essential step in the workup and treatment of patients with upper GI complaints (bleeding, reflux, dysphagia), particularly when surgery is being considered. It is also indicated for **suspected foreign body ingestion**, need for gastrostomy tube, surveillance of neoplasms, evaluation of anatomic reconstructions, caustic ingestion, dilation of esophageal strictures, and ligation of varices.
  - The esophagus should be examined for evidence of injury to the mucosa. Mucosal injury often manifests as ulcerations, peptic strictures, and Barrett esophagus.
  - EGD should be performed in a symptomatic patient. It may be done electively or emergently.
  - During EGD, biopsies may be performed for both diagnostic and therapeutic purposes. Treatment may involve hemostasis, stenting, or dilation.
- Contraindications
  - Risks that outweigh benefits
  - Inability of patient to cooperate
  - Presence of known or suspected perforated viscus (unless endoscopy is going to be used as therapy for perforation)
  - Cardiac events. American Heart Association (AHA) recommendations:
    - Waiting 60 days for noncardiac surgery after a myocardial infarction if the patient has not undergone coronary revascularization
    - Waiting 14 days after balloon angioplasty, 30 days after metal stent placement, and 365 days after drug-eluting stent placement

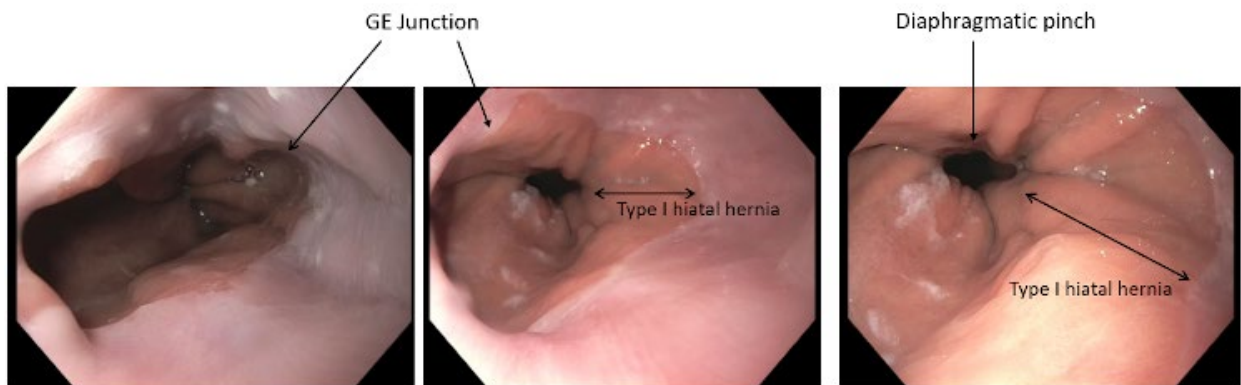
### 2. Operative Anatomy

In a patient undergoing EGD, identify relevant anatomic features. Note any significant alterations in anatomy (eg, hiatal hernia).

- Midesophagus. This long, straight tube is characterized by smooth, pink squamous mucosa. Elements to note include mucosa and its color, erythema, erosions, ulcers, strictures, rings, webs, varices, and diverticula, such as Zenker diverticula—outpouching of the posterior oropharynx just proximal to the upper esophageal sphincter.



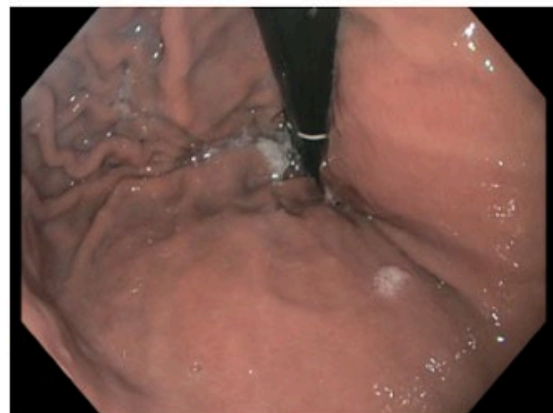
- Gastroesophageal (GE) junction. This is the irregular-appearing junction between the squamous mucosa of the esophagus and the columnar gastric mucosa of the stomach. A hiatal hernia appears as a saccular portion of gastric mucosa above the pinching action of the diaphragm.



- Stomach. This is characterized by characteristic folds known as rugae.



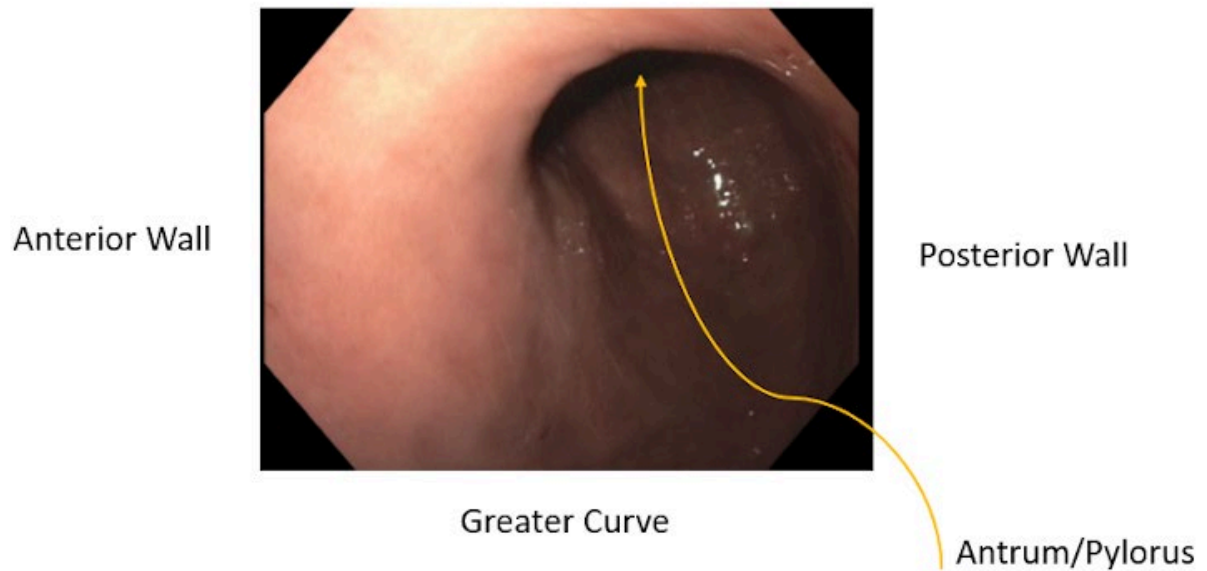
Rugal folds of stomach body



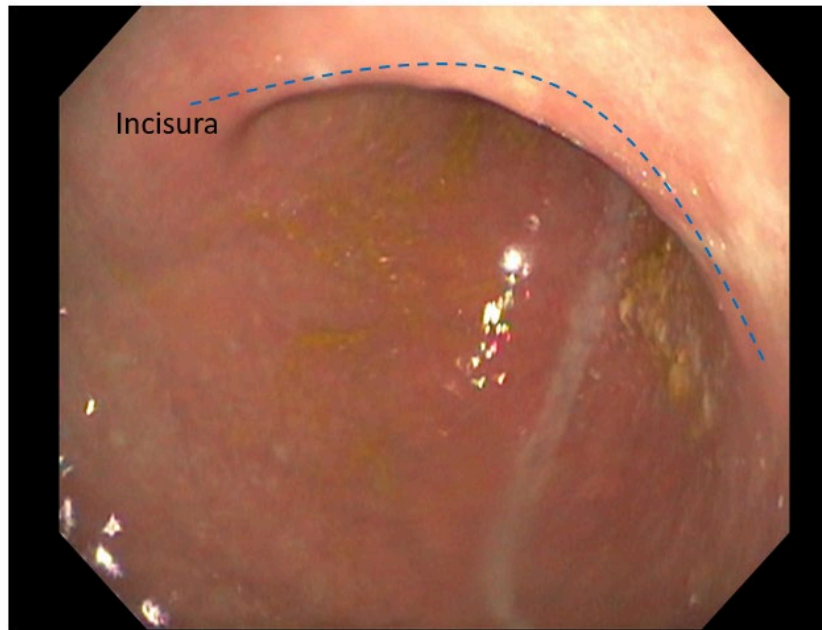
Rugal folds of fundus seen on retroflexion

- The lesser curvature is at the 12 o'clock position, the posterior gastric wall is at the 3 o'clock position, and the greater curvature is at the 6 o'clock position.

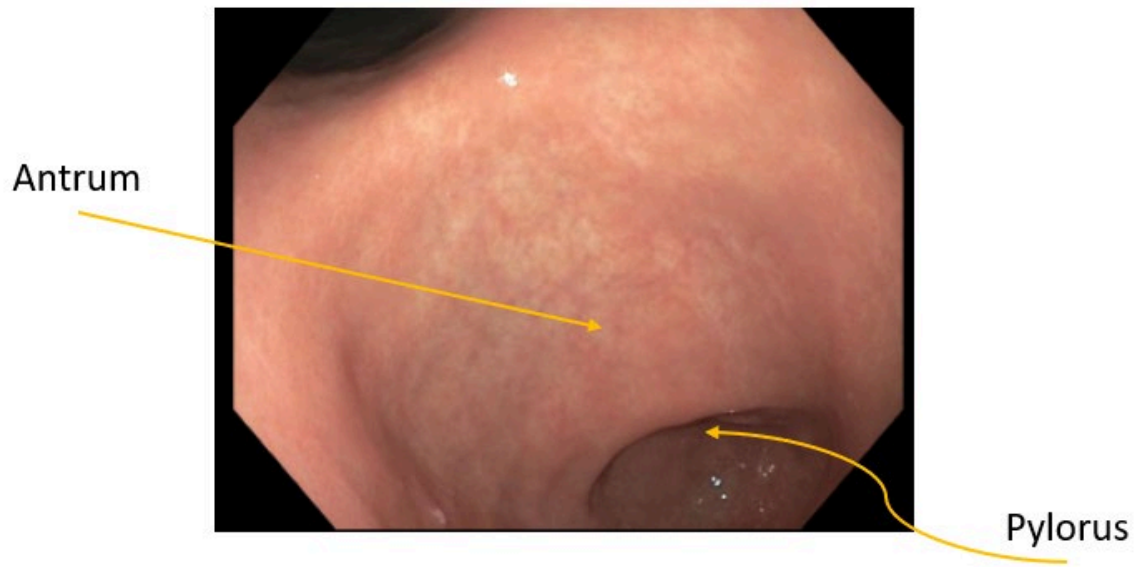
### Lesser Curve with Incisura



- The incisura angularis is reached by following the lesser curvature, and it divides the gastric body from the antrum.



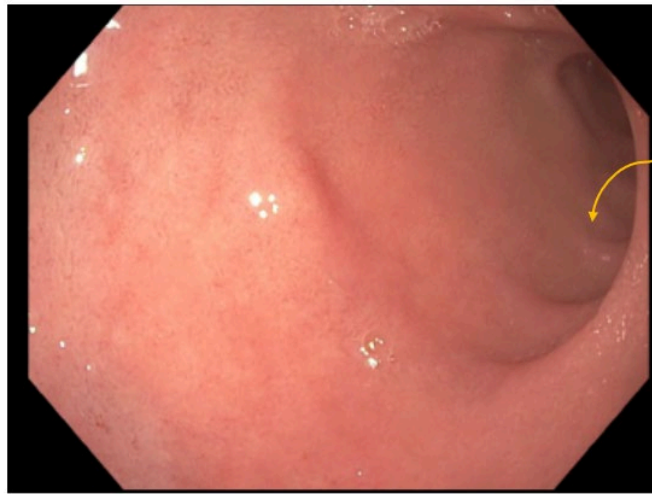
- The large rugal folds of the body of the stomach disappear as the antrum is entered.



- Pylorus. This round muscle at the edge of the antrum is seen opening and closing with advancement of the endoscope.



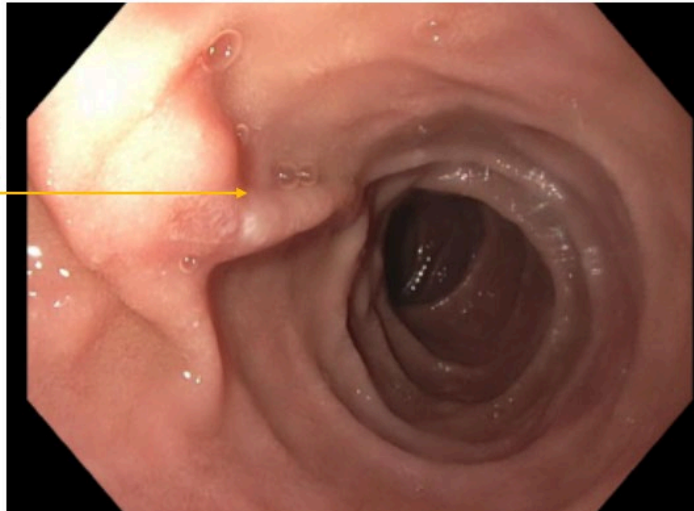
- Duodenal bulb. Semicircular folds are the hallmark of its architecture (valvulae conniventes).



valvulae conniventes

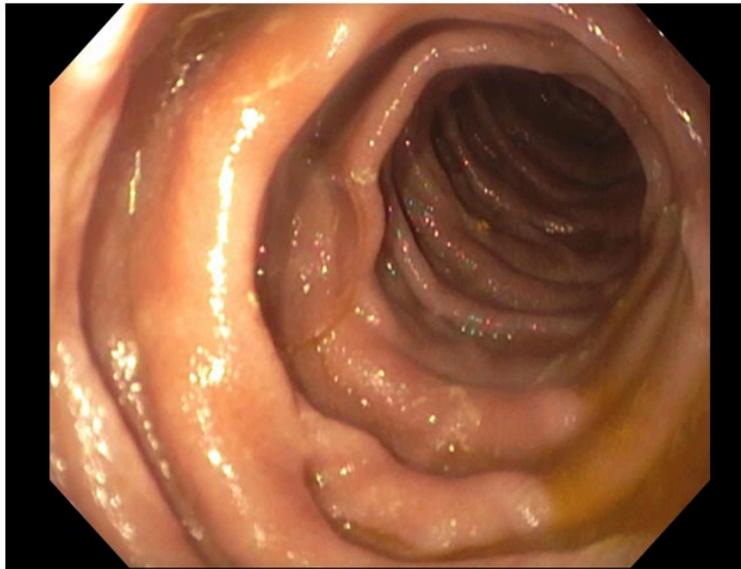
- Descending duodenum (second portion). This is marked by the ampulla of Vater, which may be seen medially. Further advancement with a sharp medial turn yields visualization of the third portion of the duodenum.

Ampulla along  
medial wall of  
D2



- Common regions for foreign body impaction in the esophagus at three areas of physiologic narrowing are the upper esophageal sphincter, crossover of the aorta, and lower esophageal sphincter.
  - After reaching the stomach, a foreign body has a 90% chance of passage. However, objects wider than 2 cm may fail to advance through the pylorus.





### 3. Preoperative Preparation

For a patient who is to undergo EGD, give a brief overview of the procedure to the patient and the family in such a way that they understand the procedure and the attendant risks. Discuss the ways in which patients should prepare for the procedure and consider necessary medication adjustments.

- Brief overview of the procedure
  - EGD entails placement of a videoscope into the esophagus for evaluation and/or treatment using direct visualization. Tissue samples may be obtained.
  - Assessment extends from the mouth to the duodenum.
  - The benefit is the ability to diagnose and simultaneously treat many upper GI problems in a minimally invasive manner, but the risks of the procedure include bleeding, esophageal perforation, and stricture formation.
- Oral intake. Patients must have no food by mouth 4 to 8 hours prior to the procedure (institutions vary). Some institutions allow clear liquids until 2 hours prior to the procedure.
- Medications. Most agents can be taken with a sip of water and continued up until the time of endoscopy.
  - Nonsteroidal anti-inflammatory drugs (NSAIDs) and aspirin. In general, these can be continued safely in patients receiving an upper endoscopy.
  - Antiplatelets
    - Low-risk procedures: bleeding risk less than 1% (EGD with or without mucosal biopsy, colonoscopy, endoscopic retrograde cholangiopancreatography [ERCP] without sphincterotomy, or ERCP biliary stent placement)
      - No interruption of antiplatelets is necessary after elective low-risk procedures.
      - Antiplatelets may be restarted after procedures with a low risk of rebleeding, no identified bleeding source, and no active bleeding.
    - High-risk procedures: bleeding risk greater than 1% (EGD with esophageal variceal ligation, esophageal dilation, percutaneous

endoscopic gastrostomy [PEG], colonoscopy with polypectomy, ERCP with sphincterotomy)

- For patients undergoing procedures with a high or uncertain bleeding risk:
  - If there is a low thrombotic risk (needs to be discussed with clinician managing antiplatelet agent), discontinue the antiplatelet.
    - Clopidogrel 5 days prior
    - Prasugrel 7 days prior
    - Ticagrelor 3 to 5 days
  - If there is a high thrombotic risk, delay elective endoscopic procedures until the risk is lower.
- Restarting medication after procedures with a high bleeding risk:
  - An interval of 1 to 3 days is usually sufficient, provided hemostasis is achieved during the procedure.
- Antibiotics
  - Procedure-related indications. These agents are not usually recommended. However, they are used in the following patients:
    - In those undergoing endoscopy for variceal bleeding or PEG placement
    - In those receiving ERCP for cholangitis, who should already be on scheduled antibiotics
    - In those with inadequate endoscopic biliary drainage following ERCP for biliary obstruction, who should receive antibiotics postoperatively for risk of post-ERCP cholangitis
    - In those undergoing EUS with fine needle aspiration of a pancreatic cyst
  - Patient-related indications
    - Prosthetic valve or prior endocarditis. Antibiotics are not considered to be indicated for antibiotic prophylaxis. Also, these drugs are not indicated for patients with pacemakers, defibrillators, or cardiac stents.
    - Immunocompromised status, with an absolute neutrophil count less than 500/ $\mu$ L or advanced hematologic malignancies. Antibiotics should be given for a high risk of bacteremia.
    - Cirrhosis. Antibiotics are recommended for acute GI bleeds or if ascites is present.
    - Vascular grafts. Antibiotics are not necessary if the graft has been in place for 6 months or more.
    - Prosthetic joints. Antibiotics are not recommended.
    - Peritoneal dialysis. The abdomen needs to be emptied of fluid, but no antibiotics are needed (unless concurrent lower endoscopy is being performed).
- Preprocedure testing. No routine preprocedure laboratory tests, chest x-rays, or electrocardiograms are usually indicated. Testing should be selective. Required tests may include:
  - Pregnancy test
  - Coagulation studies for patients with active bleeding, history of bleeding, anticoagulant use, prolonged biliary obstruction, or malnutrition
  - Chest x-ray in decompensated heart failure or with new respiratory symptoms
  - Hemoglobin and hematocrit for patients (1) with preexisting anemia or active bleeding or (2) high risk of blood loss during the procedure

- Serum chemistry for patients with renal, hepatic, or endocrine disorders
- Anesthesia. Certain factors should be considered.
  - History of prior difficulties with anesthesia or a history of agitation, anxiety, or nausea/vomiting postanesthesia
  - Aspiration risk: nonempty stomach, gastric outlet obstruction, or active bleeding
  - Difficult airways: obesity, Mallampati score, or prior history of difficult intubations
  - Testing without sedation. Select patients may undergo endoscopic procedures without sedation. Small-diameter endoscopes (< 6 mm) improve tolerability, and topical anesthesia via pharyngeal sprays (lidocaine, tetracaine, and benzocaine) is frequently used during unsedated endoscopy.
  - Testing with some sedation/anesthesia. The majority of patients require a range from minimal sedation to general anesthesia, with moderate sedation typically sufficing for diagnostic and uncomplicated therapeutic endoscopy.
  - See also module on **Conscious Sedation**.
  - Patient age, health status, concurrent medications, and level of anxiety and pain tolerance should be assessed when determining the appropriate amount of sedation.
  - Procedural variables such as the degree of invasiveness should also be considered.

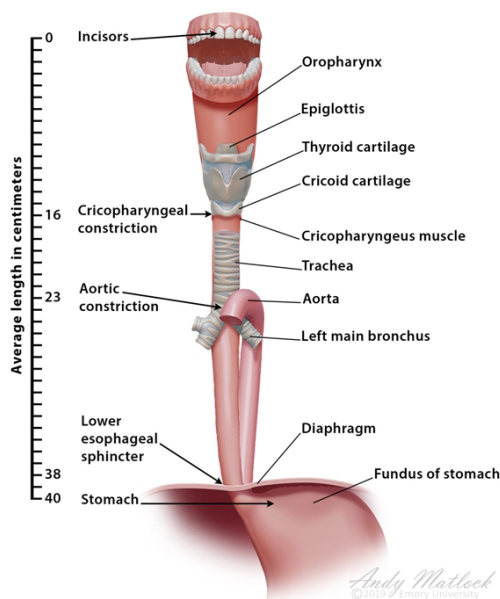
#### 4. Key Steps of the Procedure

When performing EGD, describe how to pass the scope through the upper GI tract to the level of the third portion of the duodenum.

- The patient should be positioned left side down, with the neck flexed forward. Proper monitoring and anesthesia, as indicated, should be provided.
- The endoscope is advanced under direct visualization over the tongue until the epiglottis and vocal cords are visualized. Gentle pressure is then applied, and some insufflation and gentle chin lift are used to advance the scope into the esophageal introitus, 15 to 18 cm from the incisors. Assistance is sometimes required to maintain alignment of the posterior pharynx to allow for straight passage of the endoscopy.
- Once the esophageal lumen is entered, air is insufflated so the mucosa may be inspected. The endoscope may be advanced slowly and carefully while maintaining visualization.
- The esophagus is then examined and is usually about 25 cm in length. The GE junction is noted by the "Z" line, or the junction between columnar gastric mucosa (salmon colored) and squamous esophageal mucosa (pale pink). This is usually about 40 cm from the incisors. Addressing the difference between the "Z" line versus the GE junction with diaphragmatic pinch is important should there be a significant hiatal hernia.
- Once the stomach is entered, it should also be insufflated with air. Identification of gastric folds indicates the entrance into the stomach. Full insufflation of the stomach should be avoided because this may induce retching or vomiting. The pool of fluid in the gastric fundus should be suctioned to improve visualization and decrease the risk of reflux and possible aspiration. The scope may be retroflexed to view the gastric cardia, fundus, lesser curvature, and GE junction.
  - The stomach is distended with air.
  - The scope is advanced to the region of the angularis on the lesser curvature in antrum and dialed up to achieve a 150-degree bend at the endoscope tip. The endoscope can be locked to increase stiffness.
  - The scope is withdrawn in order to pull the tip in close proximity to the esophagogastric junction. The scope is then rotated to obtain a 360-degree view.



- The scope can then slowly be advanced into the antrum and toward the pylorus. If one is having difficulty advancing scope into the antrum, one can decrease insufflation of the stomach. As well, placing external pressure in the left upper quadrant may help with passage of scope.
- The duodenal bulb is inspected for inflammation or ulceration, and then the scope is advanced into the descending duodenum. At this point, the ampulla of Vater may be visualized at the medial duodenal wall. The scope may be advanced to the level of the third portion of the duodenum before it is withdrawn back through the stomach and esophagus and finally removed. Air should be removed on the way out to minimize patient discomfort or any postprocedure bloating.
- Throughout the procedure, principles of safe conscious sedation should be practiced. One should provide continuous pulse oximetry, end-tidal CO<sub>2</sub> monitoring, close blood pressure monitoring, and electrocardiographic monitoring.



## 5. Intraoperative Decision Making

Describe common techniques and maneuvers used in tissue sampling.

- Mucosal lesions and/or neoplasms require biopsy.
- Esophageal lesions are more difficult. The accessory channel of endoscopes places forceps parallel with the wall of the esophagus. One needs to turn the scope into the wall or suction mucosa into the biopsy forceps before tissue acquisition.
- Biopsy is performed through the passage of biopsy forceps through the endoscope. The majority of biopsy forceps have a spike that allows acquisition of more than one sample at a time.
  - It is necessary to be careful and document where each of the biopsies are retrieved from and ensure that staff helping with the procedure document correctly where biopsies were performed.
  - Small lesions may concomitantly undergo thermal destruction using insulated forceps after biopsy. Argon plasma coagulation or Gold Probe forceps can also be used for this purpose. For pedunculated masses, a wire loop with a coagulation current may also be used to remove suspicious tissue.

- The endoscopist should be adept at the setup of the endoscope to troubleshoot any issues that may come up with the equipment. Other common problems include:
  - Excessive motility. It is possible to just wait out the period of hypermotility. Glucagon can be used to decrease motility.
  - Bubbles and excess mucus. A syringe or irrigating device can be used to wash these away. Also, simethicone can be used to decrease surface tension of bubbles, and *N*-acetylcysteine can be used as a mucolytic.
  - Retained material in the stomach. This needs to be cleared for visualization, with copious irrigation. Erythromycin or metoclopramide given 30 to 90 minutes prior to the procedure can also be used. Specialized suction devices are available.
  - Abnormal anatomy. A J-shaped stomach or surgically altered anatomy may make the procedure more difficult. External pressure applied to the abdomen and changes in patient position can help traverse difficult areas.

## 6. Complications and their Treatment

In a patient who has recently undergone EGD with duodenal biopsy and in whom abdominal pain and signs of peritoneal inflammation develop, implement a plan for diagnosis and treatment of potential duodenal perforation.

- Perforation of the duodenum as the result of EGD occurs in 0.1% of cases. Perforation of the esophagus and stomach may also occur during upper endoscopy. Risks include proximal stricture, eosinophilic esophagitis, biopsy perforation, and other pathologies.
- If duodenal perforation is suspected, and the patient's vital signs are stable, an upper GI series or computed tomography (CT) with oral contrast is indicated to localize the perforation.
- The patient's health and comorbidities should always be considered prior to implementing either an operative or nonoperative management approach to perforation.
- Small perforations may be managed conservatively with antibiotics and bowel rest, with placement of a CT-guided drain for any development of fluid collection or abscess. Occasionally, perforations are managed with repeat EGD using clips, stents, and suturing devices, although this is rarer and operator dependent. Pneumoperitoneum may not be evident depending on the location of the injury.
- Patients who are clinically unstable, or who have a large perforation evident on imaging, should be taken emergently to the operating room. Depending on the location of the perforation, the patient may require a gastroduodenostomy, a segmental duodenal resection with duodenoduodenostomy, or a pancreatoduodenostomy.

## Discussion Questions

### Question 1

In what settings would an EGD be recommended as an appropriate initial diagnostic study for a patient with foregut complaints?

#### Key Discussion Points

- a. Understand that so-called "alarm" symptoms (eg, weight loss, dysphagia, hematemesis) are indications for EGD.
- b. Know that EGD would be recommended with presentations with a high likelihood of need for tissue sampling or endoscopic therapeutic intervention (eg, bleeding, dilation, biopsy of suspected neoplasm).

- c. Realize that EGD should be performed in the case of persistent symptoms when other studies are negative and/or empiric therapies are ineffective.

### **Question 2**

Describe the common complications of an EGD that should be part of an informed consent discussion.

#### Key Discussion Points

- a. Understand that possible cardiopulmonary complications include hypoxemia, CO<sub>2</sub> retention, and arrhythmia related to sedation.
- b. Consider that perforation, particularly in the case of dilation; stent placement; or repeat thermal therapy may occur.
- c. Inform patients that bleeding is a possibility, particularly if aggressive biopsies or endoscopic resections are necessary, or in the case of underlying use of medications predisposing to bleeding after biopsy or lesion removal.

### **Question 3**

A patient develops abdominal pain and tenderness after EGD and duodenal biopsy for suspected celiac disease. How do you further evaluate the patient's complaints?

#### Key Discussion Points

- a. Obtain an upright abdominal film for free air.
- b. Order a CT scan with oral contrast to look for leak, retroperitoneal injury to duodenum, and hematoma.
- c. Obtain a water-soluble upper GI contrast study.

### **Question 4**

Describe the tissue sampling methods you might use to evaluate a gastric mass identified at the time of EGD.

#### Key Discussion Points

- a. Recognize that a forceps biopsy (eg, standard, jumbo, or multiple biopsies, biopsy-on-biopsy technique for a submucosal mass) is a possibility.
- b. Consider snare biopsies (hot vs cold).
- c. Use a "lift and cut" or large-particle biopsy technique with double-channel therapeutic endoscope for larger submucosal lesions (with the caveat that this carries an increased risk of perforation).

### **Question 5**

For a patient undergoing EGD for upper GI bleeding, what measures can assist in improving visualization of the bleeding point during the endoscopic evaluation?

#### Key Discussion Points

- a. Perhaps use Ewald tube lavage of the stomach prior to endoscope insertion.
- b. Consider preprocedural erythromycin as a motilin agonist.
- c. Realize that use of a double-channel scope allows irrigation/suction.
- d. Change the patient position during the procedure to move a clot.

### **Question 6**

For a patient who presents with an esophageal foreign body, what components of the history are important to determine if endoscopy is necessary, and if so, what equipment may be needed?

#### Key Discussion Points

- a. Recognize that the inability to clear secretions indicates a total obstruction.

- b. Understand that depending on clinical status and what was ingested, endoscopy may be emergent, urgent, or elective, but it should not be delayed for more than 24 hours.
- c. Realize that conscious sedation is usually appropriate but that general anesthesia may be required.
- d. Understand that special instruments or maneuvers may be necessary, particularly for long or sharp objects.

## **SCORE Resources**

Sabiston Textbook of Surgery: The Biological Basis of Modern Surgical Practice, 21st ed.

- [Ch. 42: Esophagus.](#)
- [Ch. 43: Gastroesophageal reflux disease and hiatal hernia; Gastroesophageal reflux disease, Preoperative diagnostic testing.](#)
- [Ch. 47: Acute gastrointestinal hemorrhage.](#)
- [Ch. 49: Stomach.](#)

SCORE video: [Endoscopy, Upper Gastrointestinal; Esophagogastroduodenoscopy.](#)

[The American Board of Surgery's Entrustable Professional Activities - General Surgery. Flexible GI Endoscopy.](#)

## **Additional Resources**

[American Society for Gastrointestinal Endoscopy \(ASGE\) Guidelines \(Upper GI\).](#)