

Diagnostic upper endoscopy

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Key Points

- Upper endoscopy is a commonly performed procedure.
- Always intubate under direct vision and never push.
- Be aware of 'blind' areas, which can be easily missed.
- Cancers should be classified using the Paris classification system.

Introduction

Esophagogastroduodenoscopy (EGD) is one of the commonest procedures that a gastroenterologist performs. This chapter covers how to perform a diagnostic upper endoscopy. Therapeutic interventions in upper endoscopy are discussed in Chapter 7.

1. Upper gastrointestinal anatomy

1.1. The esophagus

The cervical segment of the esophagus begins at the upper esophageal sphincter, which is 15 cm from the incisors and is 6 mm long (Fig. 1). The thoracic segment of the esophagus is approximately 19 cm long. Its lumen is open during inspiration and closed during expiration. The imprint of the arch of the aorta is sometimes apparent at 25 cm from the incisors on the left. How to describe where a lesion is in terms of anterior, posterior, right, left, is very important and is shown in Figure 2. The transition between the esophagus and gastric epithelium (Z line) is identified by the change in color of the mucosa from pale-pink to reddish-pink.

1.2. The stomach

The stomach extends from the cardia to the pylorus (Fig. 3). The fundus is the portion of the stomach above

the horizontal line that passes through the cardia and that is visible in a retroflexed endoscopic view. The body is the remainder of the upper part of the stomach and is delimited at its lower edge by the line that passes through the angular notch. Endoscopically, the transition from the body to the antrum is seen as a transition from rugae to flat mucosa (Fig. 4). The pylorus is a circular orifice, which leads to the first part of the duodenum.

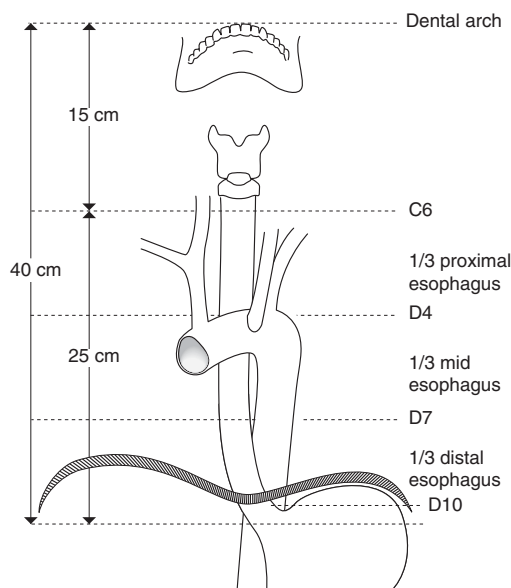


Figure 1 Main anatomical features of the esophagus.

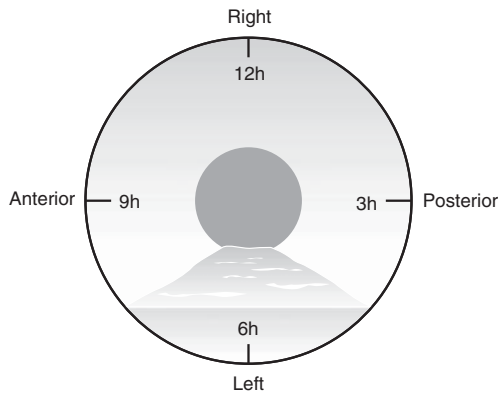


Figure 2 Orientation in the esophagus. It is very important to understand your orientation in the esophagus so that you can describe where a lesion is. This figure demonstrates the orientation of the esophagus when the patient is in the left lateral decubitus position, water naturally stays in the left face.



Clinical Tip

Always consider linitis plastica if the stomach fails to distend normally.

When the patient is in the lateral left decubitus position, the greater curvature is at the bottom, the lesser curvature at the top, the posterior stomach wall on the right, and the anterior stomach wall is on the left (Fig. 4). The anterior wall can be visualized with transillumination, a technique used for PEG insertion (see Ch. 4). A normal stomach distends fully with insufflation, with the rugae flattening out (Fig. 5).

1.3. The duodenum

The duodenum extends from the pylorus to the duodeno-jejunal angle. The duodenal bulb extends from the pylorus to the genu superius. The second portion (D2) extends from

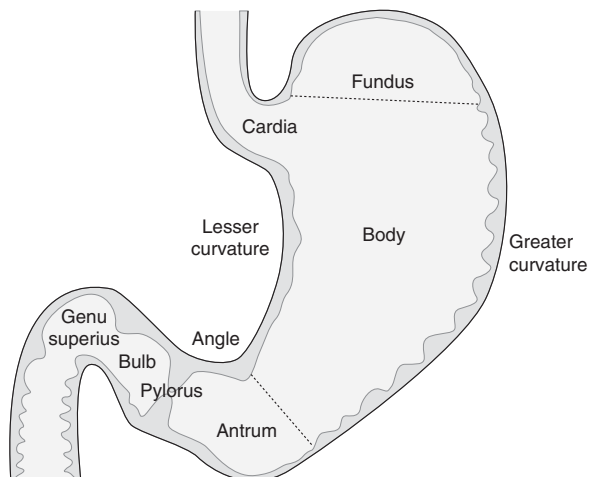


Figure 3 Gastric anatomy.

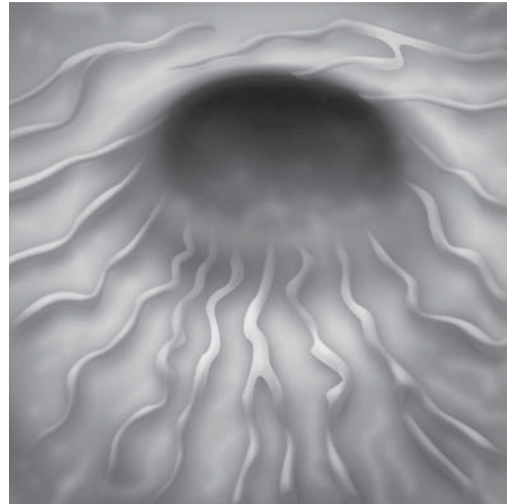


Figure 4 Orientation in the stomach. When the patient is in the lateral left decubitus position, the greater curvature is at the bottom, the lesser curvature at the top, the posterior stomach wall on the right, and the anterior stomach wall on the left.

the genu superius to the genu inferius. The ampulla of Vater is usually found in a horizontal fold in the middle of D2 (Fig. 6). The accessory papilla is a small protuberance, which is usually found just superior and proximal to the ampulla of Vater.

1.4. Postoperative endoscopy of the stomach and duodenum

Common post-surgical anatomy includes a Billroth I (Fig. 7), where only one lumen is present. In a Polya or Billroth II (Fig. 7), two gastrojejunal orifices are visible. The afferent limb leads to the duodenum, while the efferent limb leads to the colon.



Clinical Tip

The afferent limb is usually the more difficult limb to enter.

2. Indications

Upper endoscopy (EGD) is indicated for investigation of the following presentations or for screening for pre-malignant lesions.

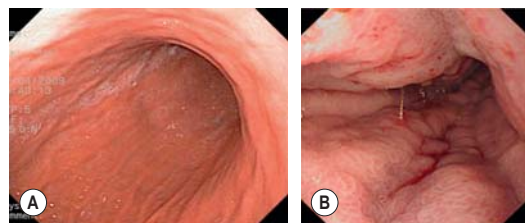


Figure 5 Insufflation of the stomach. (A) Normal insufflation of the stomach. (B) Non-distention of the stomach in a patient with linitis plastica.

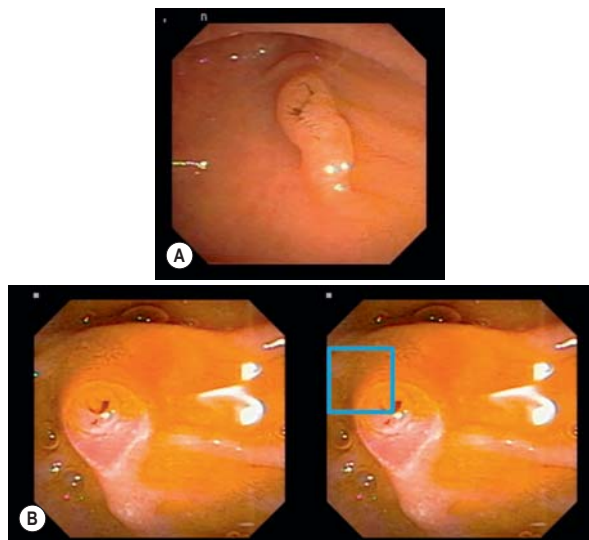


Figure 6 (A) Normal ampulla of Vater. (B) Biopsies should be taken AWAY from the pancreatic orifice to avoid pancreatitis. A safe area to biopsy is the upper left quadrant in the area within the box.

2.1. Dyspepsia

Age ≥ 50 with new onset dyspepsia:

- Should undergo EGD regardless of whether they have alarm symptoms.

Age < 50 with dyspepsia:

- Patients with alarm symptoms should undergo EGD
- Those without alarm symptoms should undergo an initial test-and-treat approach for *H. pylori*
- Patients who are *H. pylori*-negative should be offered a short trial of PPI therapy
- Patients who do not respond to empiric PPI therapy or have recurrent symptoms after an adequate trial should undergo endoscopy.



Clinical Tips

Upper GI alarm symptoms

- Age ≥ 50 with new onset symptoms.
- Family history of upper GI malignancy.
- Unintended weight loss > 6 lb (2.7 kg).
- GI bleeding or iron deficiency anemia.
- Progressive dysphagia.
- Odynophagia.
- Persistent vomiting.
- Palpable mass or lymphadenopathy.
- Jaundice.

Box 1 Indications for upper endoscopy

- Dyspepsia associated with alarm symptoms at any age.
- New onset dyspepsia in a patient ≥ 50 .
- Dysphagia or odynophagia.
- Symptoms of GERD that persist or recur despite appropriate therapy.
- Persistent vomiting of unknown cause.
- Diseases in which the presence of upper GI pathology may affect planned management, e.g. decision to anticoagulate.
- Confirmation of radiological abnormalities.
- Suspected neoplasia.
- Assessment and treatment of GI bleeding (acute or chronic).
- Sampling of tissue or fluid.
- To document or treat esophageal varices.
- Surveillance for malignancy in high risk groups, e.g. Barrett's esophagus, hereditary gastric cancer families.
- Follow-up of gastric ulcer.
- Follow-up of patients who undergo endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD) of an early cancer.

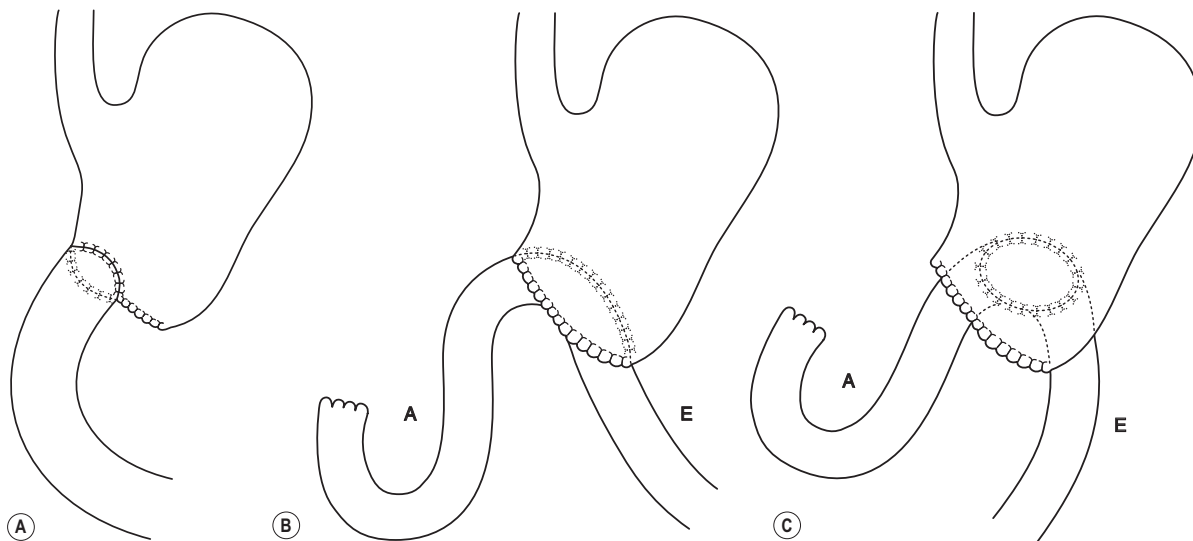


Figure 7 (A) Billroth I. (B) Billroth II. (C) Billroth III. A, afferent limb. B, efferent limb.

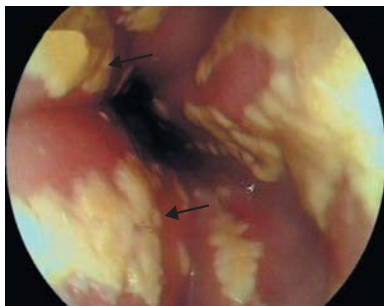


Figure 8 Odynophagia. *Candida* esophagitis causing dysphagia and odynophagia. Note the white plaques (arrows).

2.2. Dysphagia or odynophagia

Unless there is a clear history pointing to a neurological cause or ENT origin for dysphagia, all patients should undergo urgent EGD as their first investigation (Fig. 8). Note, patients with GERD can present with atypical symptoms including laryngitis, chronic cough or bronchospasm.

2.3. Gastroesophageal reflux

- Gastroesophageal reflux (GERD) can be diagnosed on the basis of typical symptoms without the need for EGD
- In patients with uncomplicated GERD an initial trial of empiric medical therapy is appropriate
- EGD should be performed if patients have alarm symptoms or symptoms suggesting complicated GERD or in patients who fail to respond to empiric medical therapy.

Box 2 Upper endoscopy is not indicated

- Symptoms felt to be functional in origin.
- 'Simple' dyspepsia <50 years of age.
- Metastatic adenocarcinoma of unknown primary site when the results will not alter management.
- Radiographic findings of an asymptomatic/uncomplicated sliding hiatal hernia, uncomplicated duodenal ulcer or deformed duodenal bulb when symptoms are absent or respond to ulcer therapy.
- Surveillance of *healed* benign disease.
- Surveillance during repeated dilations of benign strictures unless there is a change in status.

2.4. Persistent vomiting

EGD is indicated for isolated vomiting persisting for over 48 hours after acute intestinal obstruction and non-digestive causes have been excluded.

2.5. Assessment and treatment of upper gastrointestinal bleeding

- EGD is indicated in patients suspected of having an acute upper gastrointestinal bleed (hematemesis or melena) (see Ch. 7 for how to treat upper GI bleeding.)
- EGD should be repeated if bleeding persists when an initial examination including upper endoscopy and colonoscopy has been inconclusive (Fig. 9).

2.6. Investigation of chronic anemia and/or iron deficiency

- All patients should be screened for celiac disease (Fig. 10f)

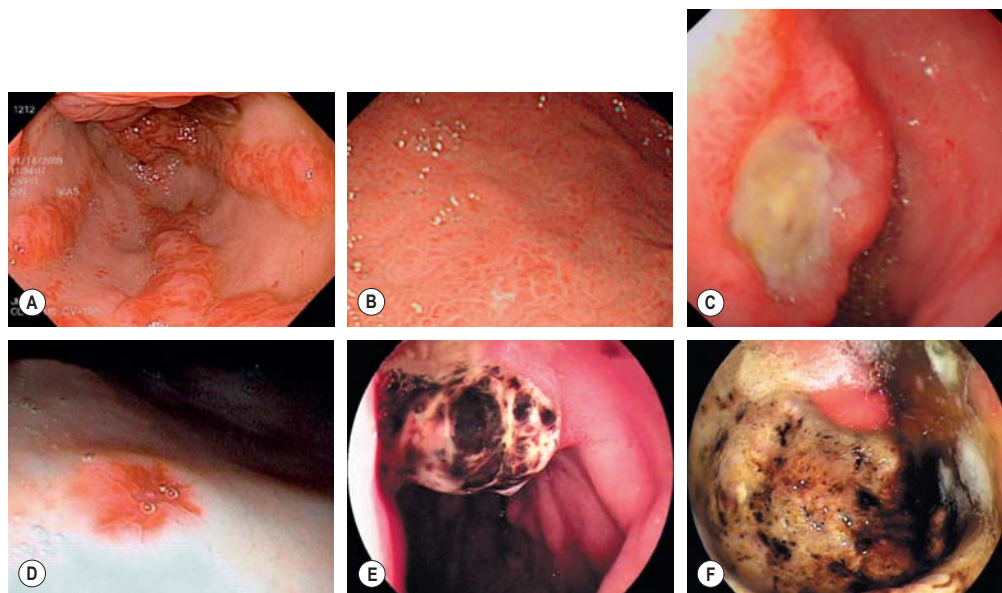


Figure 9 Bleeding lesions. (A) Gastric Antral Vascular Ectasia (GAVE); (B) portal hypertensive gastropathy; (C) duodenal ulcer; (D) gastric arterio-venous malformation (AVM); (E) ulcer with adherent clot in the duodenum; (F) large benign necrotic gastric ulcer.

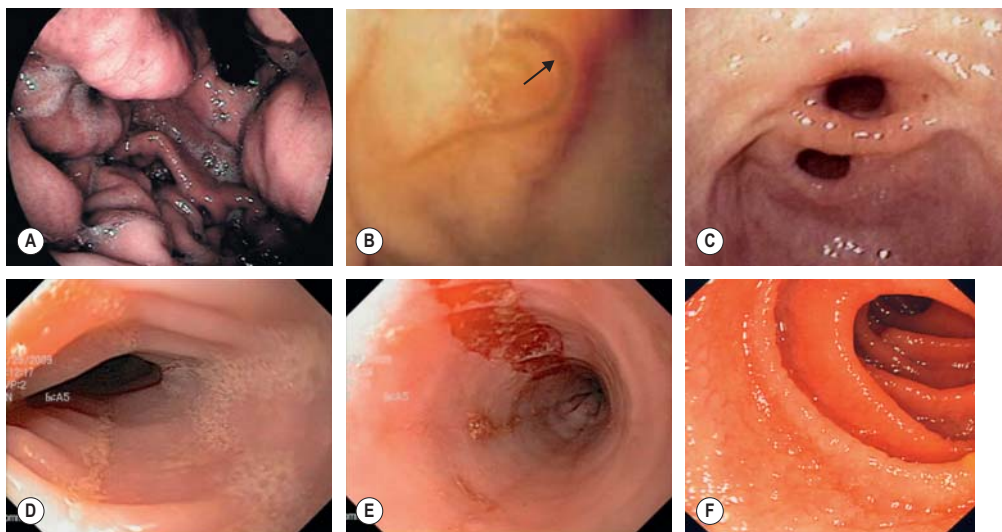


Figure 10 Miscellaneous. (A) Hypertrophic gastric folds in Zollinger–Ellison syndrome. (B) Anisakis worm (arrow). (C) Pyloric duplication. (D) Eosinophilic esophagitis with classic ridges. *Beware* dilating strictures in these patients as there is an increased risk of perforation. (E) Esophageal mucosal tear in a patient with eosinophilic esophagitis. (F) Celiac disease with scalloping of the edges of the mucosa.



Clinical Tip

The optimum number of duodenal biopsies for accurate diagnosis of celiac disease is four.

- EGD and colonoscopy should be considered in all male patients, unless there is a history of overt non-GI blood loss
- EGD and colonoscopy should be considered for female patients who are post-menopausal, ≥ 50 years of age, or have a strong family history of colorectal cancer
- The presence of esophagitis, erosions or peptic ulcer disease should not be accepted as the cause of anemia until colonoscopy is performed and is normal.

2.7. When to obtain duodenal biopsies

Duodenal biopsies during upper endoscopy are indicated in the following situations:

- Iron-deficiency anemia with no identified cause
- Folate deficiency (combined with gastric biopsies)
- Other nutritional deficiencies
- Isolated chronic diarrhea
- Dermatitis herpetiformis
- Confirmation of celiac disease in patients with positive serology
- If parasitic diseases are suspected when a parasitological stool examination has been negative (giardiasis, strongyloidosis).

2.8. To assess portal hypertension

- To detect esophagogastric varices in patients with cirrhosis or non-cirrhotic portal hypertension (Figs 9A,B, Figure 11) (see Ch. 7)

- Repeat EGD every 2 years in patients with cirrhosis in whom initial upper endoscopy showed no varices
- After endoscopic treatment of esophageal varices to confirm their eradication (see Ch. 7).

2.9. Screening or surveillance in patients at risk of upper GI malignancy

Upper endoscopy is also indicated for screening pre-malignant lesions.

2.9.1. Gastroduodenal ulcers

- Multiple biopsies should be performed routinely in patients with gastric ulcer with endoscopic and histological follow-up after 4–6 weeks of antisecretory treatment.
- Follow-up upper endoscopy is not indicated in an asymptomatic patient after treatment of a duodenal ulcer.
- Patients who undergo resection of an early cancer with endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD) should have close follow-up.

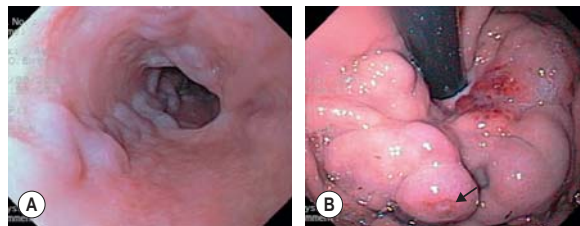


Figure 11 Esophageal and gastric varices. (A) Small esophageal varices. (B) This image is taken in retroflexion, where multiple gastric varices are present with an erosion over one (arrow).

**Clinical Tip**

All patients with a gastric ulcer should undergo repeat EGD after 4–6 weeks of antisecretory therapy to ensure ulcer healing and for biopsies if healing is incomplete.

2.9.2. Achalasia

- These patients are at increased risk of developing squamous cell cancer
- It is reasonable to commence surveillance 15 years after symptoms began. Subsequent surveillance intervals are not clear but every 2–3 years is reasonable.

2.9.3. Caustic injury

- Increased risk of squamous carcinoma, especially after lye ingestion
- Have a low threshold to investigate dysphagia with endoscopy
- Begin surveillance 15–20 years after caustic injury
- Repeat EGD every 1–3 years.

2.9.4. Tylosis

- There are two types of tylosis:
 - Type A tylosis presents between the ages of 5 and 15 years and is associated with increased risk of esophageal cancer.
 - Type B tylosis is associated with onset by age 1 and is not associated with increased risk of esophageal cancer.
- Begin surveillance at age 30
- Repeat EGD every 1–3 years.

2.10. Patients with a history of squamous cancer of the head, neck, pharynx, lung or esophagus

There are insufficient data to support screening; however, some authors advocate a single endoscopy with Lugol's iodine chromoendoscopy to look for squamous esophageal cancer.

2.11. Gastric epithelial polyps

- All gastric polyps should be biopsied to determine whether they are hyperplastic or adenomatous (Fig. 12)
- Adenomatous polyps are at risk of malignant transformation and should be resected
- Surveillance endoscopy should be performed 1 year after removing an adenomatous gastric polyp. If

surveillance is negative, EGD should be repeated at 3–5 years. Surveillance in patients with high-grade dysplasia or early gastric cancer should be individualized.

2.12. Gastric intestinal metaplasia

- Associated with >10 fold increased risk of gastric cancer in high risk parts of the world and in patients infected with *H. pylori*
- In Western countries, endoscopic surveillance is not uniformly recommended
- If surveillance is performed, a topographic mapping of the entire stomach is necessary
- Patients with high-grade dysplasia are at significant risk for progressing to cancer and should be considered for either endoscopic resection or gastrectomy. Following endoscopic therapy, these patients (with high-grade dysplasia or cancer on histology) require close follow-up a minimum of every 6 months to 1 year.

2.13. Pernicious anemia

- There may be an increased risk of gastric cancer or gastric carcinoid
- A single EGD should be performed to identify gastric cancer or carcinoid tumor in patients with pernicious anemia
- Surveillance of carcinoid tumors is controversial and should be individualized.

2.14. Gastric/bariatric surgery patient**2.14.1. Pre-surgery**

An EGD should be performed in all patients with upper GI tract symptoms who are to undergo bariatric surgery.

- An EGD should be considered in all patients who are going to undergo a Roux-en-Y gastric bypass regardless of the presence of symptoms
- An EGD should be considered in patients who are undergoing gastric banding to exclude large hernias (Fig. 13A), which could alter the surgical approach
- Patients without symptoms who opt not have an EGD should have non-invasive testing for *H. pylori*, followed by treatment if positive.

2.14.2. Post-gastric surgery

- There are insufficient data to support routine endoscopic surveillance for patients with previous partial gastrectomy for peptic ulcer disease
- There should be a low threshold for investigating upper GI symptoms in patients, post-gastric surgery.



Figure 12 Polyps. (A) and (B) Fundic gland polyps. (C) Adenomas of the duodenum.

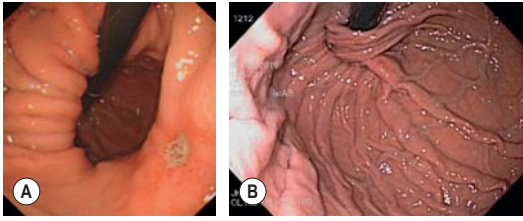


Figure 13 Retroflexed view of the fundus and cardia in (A) patient with a hiatus hernia (arrow), (B) post-Nissen's fundoplication.

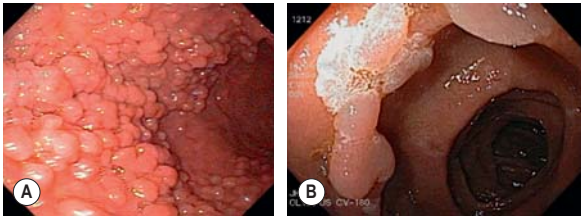


Figure 14 Familial adenomatous polyposis (FAP). (A) Image of multiple fundic gland polyps in a patient with FAP. (B) Duodenal adenoma in patient with FAP.

2.15. Familial adenomatous polyposis

- Fundic gland polyps are found in 88% of patients with FAP (Figure 14a)
- Adenomas occur in 2–50%. They are usually solitary, sessile and located in antrum
- Duodenal adenomas occur in 90% of patients (Fig. 14b)
- Jejunal and ileal polyps are present in 50–90% of patients
- Patients should undergo screening with both forward and side-viewing endoscopes between the ages of 25 and 30
- Biopsies should be taken from the largest duodenal polyps and from the ampulla
- Subsequent follow-up should be determined based on the Spigelman score (Tables 1, 2).

Table 1 Spigelman classification of duodenal polyps in patients with FAP

Polyp (n)	1–4	1 point
	5–20	2 points
	>20	3 points
Size (mm)	1–4	1 point
	5–10	2 points
	>10	3 points
Histology	Tubulous	1 point
	Tubulovillous	2 points
	Villous	3 points
Degree of dysplasia	Low	1 point
	High	3 points

Table 2 Spigelman score

Spigelman stage	Management	Endoscopic surveillance
0 (0 points)	Endoscopic surveillance	4 years
I (1–4 points)	Endoscopic surveillance	2–3 years
II (5–6 points)	Endoscopic surveillance	2–3 years
III (7–8 points)	Surgery or endoscopic management	6–12 months
IV (9–12 points)	Consider referral for surgery	3–6 months

Warning!

Biopsying the ampulla.

Biopsies should be taken AWAY from the pancreatic orifice to avoid pancreatitis. A safe area to biopsy is the upper left quadrant (see Fig. 6B).

2.16. Hereditary non-polyposis colorectal cancer (HNPCC)

- Patients with HNPCC are at increased risk of gastric and small bowel cancer
- Endoscopic surveillance should be considered commencing at age 30.

3. Contraindications

There are no absolute contraindications to EGD.

- The examination, however, may be dangerous in the following cases:
 - Known or suspected perforation. EGD should not be performed unless to insert a covered stent to treat the perforation (see Ch. 7)
 - Massive gastrointestinal hemorrhage suggesting an aortoduodenal fistula
 - Acute cardiorespiratory failure not responding to medical therapy
 - Hypovolemic shock not responding to aggressive resuscitation
- EGD should be performed with caution in the following situations:
 - Large Zenker's diverticulum
 - Severe respiratory failure
 - Thoracic aortic aneurysm
 - Strictures of the cervical esophagus.

4. Equipment

4.1. Gastroscope

- Standard gastroscopes have a diameter of ≤ 10 mm with an instrument channel of 2.8 mm
- A gastroscope with a large operating channel measuring 3.8–4.2 mm is useful in severe acute upper GI bleeding
- A gastroscope with double instrument channel is also useful in patients with an acute upper GI bleed (see

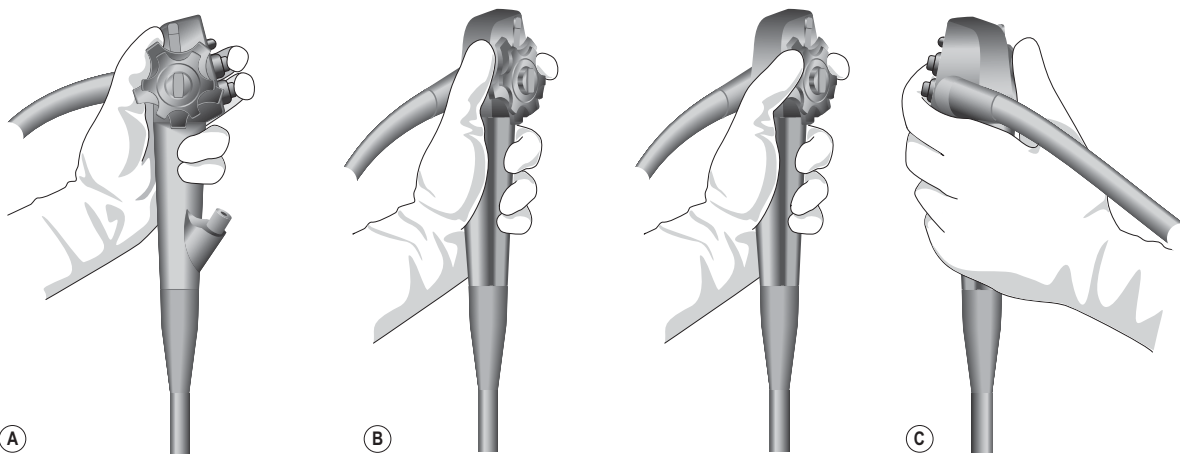


Figure 15 How to handle an upper endoscope.

Ch. 7). It can also be used with a miniprobe to assess submucosal lesions (Chapter ••)

- High-definition gastroscopes with optical zoom should be available to assess Barrett's esophagus, or when screening for pre-malignant gastric or duodenal lesions
- Small caliber gastroscopes are useful to pass through strictures. These can either be transnasal videoendoscopes or slim caliber gastroscopes (4.9–5.9 mm).

4.2. Accessories

- Biopsy forceps (standard and jumbo)
- Dye spray catheter
- Chromoendoscopy stains (see Ch. 2.4)
 - 1% acetic acid (Barrett's esophagus assessment)
 - 0.5% methylene blue (intestinal metaplasia in stomach, adenomatous polyps, Barrett's esophagus)
 - 2% (range 1.5–3%) Lugol's iodine (squamous esophageal dysplasia or cancer)
 - 0.2% (range 0.1–0.8%) indigo carmine (Barrett's esophagus or adenocarcinoma)

- Additional equipment may be required if therapeutic procedures are anticipated (see Ch. 7 for details).

5. Endoscopy technique

5.1. Handling the endoscope

The control section of the endoscope should rest comfortably in the palm of the left hand, in the V formed between the thumb and index finger (Fig. 15). The left hand controls up/down (large wheel), right/left angulation (small wheel), insufflation, water, and suction buttons, while the right hand is responsible for advancing and withdrawing the endoscope, and its axial rotation.

- Hold the endoscope approximately 30 cm from its distal end with your right hand. Your left hand should control the up/down angulation (Fig. 16)
- Check that the endoscope is correctly angulated (so that it curves down over the tongue when you insert it)
- Advance the endoscope into the mouth and to the base of the tongue

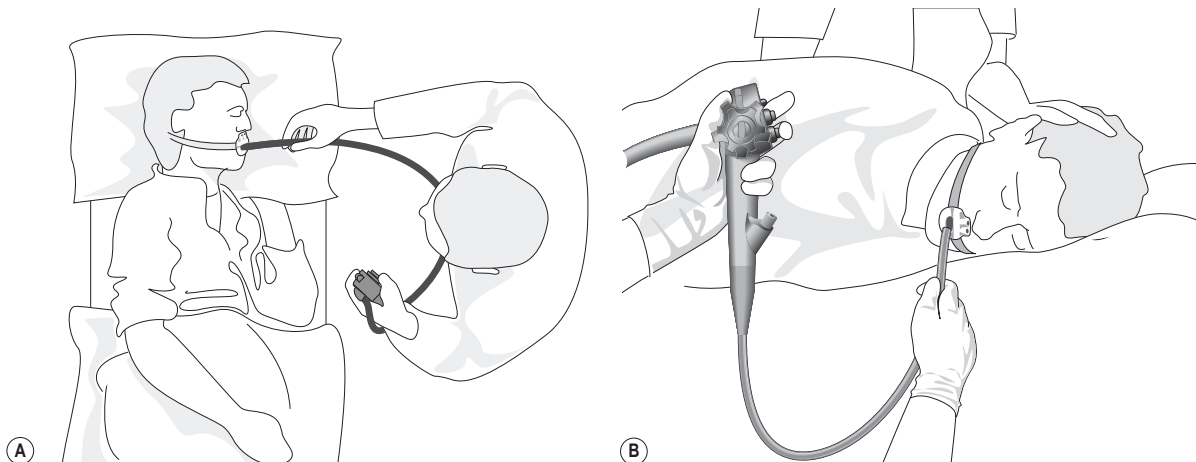


Figure 16 (A) Right and (B) left hand positioning for upper endoscopy. Hold the endoscope approximately 30 cm from its distal end with your right hand. Your left hand should control the up/down angulation.

- Gently angle the tip of the gastroscope downward until the vocal cords, epiglottis and cricoarytenoid cartilage become visible
- Pass behind and to the right of the arytenoid
- Ask the patient to swallow and apply *gentle* pressure while insufflating air
- The upper esophageal sphincter relaxes and the endoscope should be inserted under direct vision into the esophagus
- In the past, blind intubation has been used where the base of the tongue is pressed down with the index and middle finger of the left hand, and the endoscope is advanced blindly into the esophagus. However, we recommend that the esophagus should be intubated under direct vision rather than using this technique.

5.1.1. Problems with intubating the esophagus (Table 3)

- If you meet any resistance DO NOT PUSH. This will cause trauma, edema and spasm, which will make intubation more difficult. It can also cause perforation. Withdraw the endoscope slightly and confirm that you are in the correct position. If it is not possible to pass to the right of the arytenoid, try passing on the left. If



Figure 17 Zenker's diverticulum (black arrow). The true esophagus is highlighted with the white arrow.

this fails, check the patient's position. They should be fully in the left lateral position with slight, but not severe, neck flexion. If it does not work, ask the nurse assistant to provide chin lift.

- Intubated patients may sometimes need the tracheal tube balloon to be deflated to allow intubation of the esophagus.
- A Zenker's diverticulum can be recognized immediately (Fig. 17). It is important to determine which is the true esophageal lumen and which is the diverticulum. If there

Table 3 Potential problems faced in upper endoscopy and how to manage them

Problem	Cause	Action required
Respiratory distress, cyanosis	Incorrect endoscopy path with intubation of the trachea	Remove endoscope
	Desaturation associated with the following	Remedy the respiratory problem by the following:
	Respiratory insufficiency	Remove endoscope
	Cardiac insufficiency	Clear out airways
	Or abnormal cardiac rhythm	Aspirate buccal cavity
	Or laryngeal spasm	Oxygenation (mask ventilation, intubation if necessary)
	Regurgitation of gastric contents	Elevate the patient's head
Unable to intubate the upper esophagus	Zenker diverticulum	Withdraw the endoscope and reinsert it under visual control; if necessary use a wire guide under fluoroscopy to direct the endoscope
	High esophageal stricture	Dilate
Looping in esophagus	Diverticulum	Withdraw. If necessary, pass a guidewire to the cardia under fluoroscopic guidance
	Hiatal hernia	
	Achalasia or stenosis (benign, malignant or due to external compression)	Gentle dilation or use a small caliber gastroscope
Looping in stomach	J-shaped stomach	Withdraw to the GEJ and follow the lesser curve
	Altered anatomy post-surgery	Exert external pressure on the stomach
	Pyloric stenosis	Insert a guide wire through the pylorus and use this to guide the endoscope passage. This may require fluoroscopy if there is a complex stricture
		Dilation is sometimes required

is any doubt, a guidewire with an atraumatic tip can gently be guided under fluoroscopic or visual control into the esophagus and then followed with the endoscope.

- The same technique can be used with a high tight esophageal stricture. Advance a guidewire into the esophagus and follow it with the endoscope (see Ch. 7 for dilation of strictures). Alternatively, a small caliber gastroscope can be used.



Warning!

Never force the endoscope against resistance. If there is resistance, the esophagus **MUST** be intubated under direct vision.

5.1.2. Advancing the gastroscope

- The gastroscope should be advanced under visual control, applying moderate insufflation. If there are positioning problems, always withdraw and never advance blindly.
- Any fluid should be aspirated before advancing the endoscope to minimize the risk of aspiration and to ensure that all areas have been visualized. Note the appearance of the fluid (e.g. the presence of altered blood). Anti-bubble solution (simethicone) is sometimes helpful.
- The esophagus is examined while inserting the endoscope. Once the cardia is reached, pause and examine the gastroesophageal junction. The proximal margin of the gastric folds is commonly accepted as the junction of the stomach and esophagus. The level of the squamocolumnar junction should be noted. If the squamocolumnar junction is displaced proximal to the gastroesophageal junction, biopsies should be taken to look for Barrett's esophagus.
- The gastroesophageal junction should remain closed unless a swallow is initiated or air is insufflated. A patulous junction suggests the presence of reflux.
- The level of the diaphragmatic hiatus should be noted.
- Once in the gastric cavity (Fig. 18A), follow the lesser curvature as far as the pylorus without waiting for maximum inflation of the stomach (where there is disappearance of folds), as the gastric cavity will be examined on the way back.
- Antral peristalsis may prevent approach to the pylorus; simply wait a few moments before continuing to advance.
- To pass through the pylorus, position the endoscope just in front of the pylorus (Fig. 18B,C). Apply a little air and gentle constant pressure against the orifice using only up/down angulation.
- The duodenal bulb is examined on insertion, advancing and withdrawing the gastroscope until the bulb is fully visualized. If endoscope is expelled into the gastric antrum during these maneuvers, simply re-intubate the pylorus.
- To pass the superior flexure of the duodenum and enter the second part of the duodenum, position the endoscope at the apex of the bulb and perform the following maneuver: angulation to the right; right axial

rotation through 90° and angulation upwards (Fig. 18D). This is achieved by clockwise rotation of small wheel with anticlockwise rotation of big wheel. The superior flexure of the duodenum is often passed blindly and examined on the way back.

- The lower part of the second part of the duodenum is reached by 'straightening the endoscope', i.e. by withdrawing the instrument until the 70 cm marker (approximately) is visible at the incisors. In practice, this maneuver reduces the loop along the greater curve of the stomach (Fig. 18E).
- On withdrawal, insufflate the gastric lumen so that it can be examined fully.
- The endoscope should be placed in the 'retroflexed' position to visualize the fundus and cardia. To retroflex, position the endoscope in the antrum facing the pylorus, angle upwards (big wheel anticlockwise) and advance the endoscope (Fig. 18F).
- The endoscope is next withdrawn in the retroflexed position, rotating it axially through 180° to examine the fundus and the cardia (Fig. 18G).
- The endoscope is then returned to a neutral position in the body; then withdrawn.
- Once the stomach has been fully inspected, intragastric air should be removed by suctioning.
- The esophagus is again examined on withdrawal of the endoscope.
- The cervical esophagus, which is often not clearly viewed as the endoscope advances, is examined carefully on withdrawal.
- The average duration of a diagnostic upper endoscopy is 5–10 min under optimal sedation conditions.
- All lesions identified are biopsied, except for vascular malformations and duodenal ulcers.

5.2. Special situations

5.2.1. Gastroesophageal reflux disease

Gastroesophageal reflux disease (GERD) should be classified using the Savary–Miller (Table 5) or Los Angeles (Table 4) classification (Fig. 19). Longstanding or severe GERD can result in peptic stricture formation (Fig. 20) and is associated with the development of Barrett's esophagus (Fig. 21).

Table 4 Los Angeles classification of GERD

Grade	Description
A	≥1 mucosal break ≤5 mm that does not extend between the tops of two mucosal folds
B	≥1 mucosal break >5 mm that does not extend between the tops of two mucosal folds
C	≥1 mucosal break that is continuous between the tops of ≥2 mucosal folds but involves <75% of the circumference
D	mucosal break that involves ≥75% of the esophageal circumference