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for nausea in first-trimester pregnancy. Peppermint oil and caraway seed oil products and herbal preparations such as STW 5 (a nineherb mixture) are useful for functional dyspepsia and IBS. Lowpotency pancreatic enzyme preparations are sold as digestive aids but have little evidence to support their efficacy. THERAPIES TARGETING GUT DYSBIOSIS Antibiotics are prescribed to treat H. pylori–induced ulcers, infec tious diarrhea, complicated diverticulitis, and small intestinal bacterial overgrowth. Some cases of diarrhea-predominant IBS respond to the nonabsorbable antibiotic rifaximin. Probiotics con taining bacterial cultures and prebiotics that selectively nourish nonnoxious commensal bacteria have been given as adjunctive therapy for infectious diarrhea and IBS, with limited evidence of efficacy. Postbiotics are metabolites made by probiotic organisms that inhibit pathogenic luminal bacteria. Transplanting donor feces into the colon by colonoscopy or enema is effective treatment for recurrent Clostridioides difficile colitis. Commercial oral and rectal microbiota-based products have been approved or are in develop ment for this indication. THERAPEUTIC ENDOSCOPY In addition to its diagnostic role, endoscopy has numerous thera peutic capabilities. Cautery techniques and injection of vasocon strictor substances can stop hemorrhage from ulcers and vascular malformations. Endoscopically placed clips can occlude arterial bleeding sites, while hemostatic powder sprays can stop brisk per sistent GI bleeding. Endoscopic encirclement of esophageal varices and hemorrhoids with constricting bands stops hemorrhage from these sites. Bleeding gastric varices can be injected with thrombin or cyanoacrylate. Endoscopy can remove polyps in the stomach, small bowel, or colon. Decompressive colonoscopy withdraws excess gas in some cases of acute colonic pseudoobstruction. Endoscopic mucosal resection, submucosal dissection, and radiofrequency techniques ablate some cases of Barrett’s esophagus with dysplasia and resect superficial cancers or subepithelial tumors elsewhere in the gut. Obstructions of the GI lumen and pancreaticobiliary tree are relieved by endoscopic dilation or placing plastic or expandable metal stents. Endoscopic sphincterotomy of the ampulla of Vater treats choledocholithiasis. Cholangioscopy can facilitate stone lith otripsy in the common bile duct, ablation of small ductal tumors, and placement of gallbladder stents to facilitate drainage in nonop erative candidates. Interventional EUS is used for pancreatic cyst gastrostomy using lumen-apposing metal stents, pancreatic necro sectomy, and placement of fiducial markers to direct pancreatic and rectal radiotherapy. EUS also can facilitate endoscopic access to the excluded distal stomach in patients who have undergone bariatric gastric bypass surgery using similar stents so that ERCP can be done for pancreaticobiliary conditions. EUS-directed stent place ment can manage postsurgical stenoses after pancreatic resection. Endoscopy is used to insert gastric

feeding tubes. Peroral endo scopic myotomy is performed on the lower esophageal sphincter in achalasia, the pylorus in gastroparesis, and the upper esophageal sphincter for Zenker's diverticulum. Endoscopic treatments for acid reflux including transoral incisionless fundoplication have been developed as potential alternatives to surgery. Endoscopic bariatric methods, including intragastric balloons, sleeve gastroplasty, and duodenal resurfacing and diversion, have been devised.

PART 10 Disorders of the Gastrointestinal System INTERVENTIONAL RADIOLOGY Interventional radiology techniques offer benefits in selected set tings. Angiographic embolization or vasoconstriction decreases bleeding from gut sites not amenable to endoscopic intervention. Angiographic embolectomy, stent placement, and thrombolysis also manage mesenteric ischemia. Dilatation or stenting under fluoroscopic guidance relieves luminal strictures. Contrast enemas can reduce colon volvulus. CT- and ultrasound-directed drainage of abdominal fluid collections can obviate the need for surgery. Per cutaneous transhepatic cholangiography relieves biliary obstruction when ERCP is contraindicated. Percutaneous cholecystostomy treats

acute cholecystitis in patients unable to undergo cholecystectomy. Transjugular intrahepatic portosystemic shunts are performed for variceal hemorrhage not amenable to endoscopic therapy. Litho tripsy is rarely performed to fragment gallstones in patients who are not surgical candidates. Radiologic approaches are often chosen over endoscopy for gastroenterostomy placement. Radiographic assistance is sometimes needed for placement of central venous catheters for parenteral nutrition. SURGERY Roles of surgery in GI conditions include disease cure, symptom control, maintenance of nutrition, and palliation of unresectable neoplasm. Surgery cures medication-unresponsive ulcerative coli tis, diverticulitis, cholecystitis, appendicitis, and intraabdominal abscess, but only reduces symptoms and treats complications in Crohn's disease. Surgery is performed for ulcer complications like bleeding, obstruction, or perforation and intestinal obstructions that persist after conservative care. Gastroesophageal fundoplica tion is performed for refractory acid reflux. Acid exposure time on pH testing helps select candidates for fundoplication. Achalasia responds to operations to reduce lower esophageal sphincter tone. Operations for motor disorders include implanted electrical stimu lators for gastroparesis and electrical devices and artificial sphinc ters for fecal incontinence. Surgery can place a jejunostomy for long-term enteral feedings. Other common indications for surgery include hernias, hemorrhoids, and nonhealing anal fissures. PSYCHOLOGICAL APPROACHES AND PHYSICAL THERAPY Psychological therapies, including psychotherapy, cognitive behav ioral therapy, and hypnosis, show efficacy in DGBIs and are most beneficial for patients with significant psychological dysfunction. Behavioral therapists provide instruction in diaphragmatic breath ing for belching or rumination. Biofeedback methods administered by physical therapists can treat refractory fecal incontinence or constipation secondary to dyssynergia. ■ ■FURTHER READING Benech N et al: Update on microbiota-derived therapies for recurrent Clostridioides difficile infections. Clin Microbiol Infect 30:462, 2024. Gergely M et al: Management of refractory inflammatory bowel disease. Curr Opin Gastroenterol 38:347, 2022. Hossain B et al: Prevalence and impact of gastrointestinal manifesta tions in COVID-19 patients: A systematic review. J Community Hosp Intern Med Perspect 13:39, 2023. Jain S et al: Optimal strategies for colorectal cancer screening. Curr Treat Options Oncol 23:474, 2022. Orpen-Palmer J et al: Update on the management of upper gastroin testinal bleeding. BMJ Med 1:e000202, 2022. Shakir SM et al: Updates to the diagnosis and clinical management of Helicobacter pylori infections. Clin Chem 69:869, 2023. Louis Michel Wong Kee Song, Vinay Chandrasekhara, Mark

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Gastrointestinal

Endoscopy Gastrointestinal endoscopy has been attempted for over 200 years, but the introduction of semirigid and flexible gastroscopes in the mid-twentieth century marked the dawn of the modern endoscopic era. Since then, rapid advances in endoscopic technology have led to

FIGURE 333-1 Gastrointestinal endoscope. Shown here is a conventional colonoscope with control knobs for tip deflection, push buttons for suction and air insufflation (single arrows), and a working channel for passage of accessories (double arrows). dramatic changes in the diagnosis and treatment of many digestive diseases. Innovative endoscopic devices and new endoscopic treatment modalities continue to expand the use of endoscopy in patient care. Flexible endoscopes provide an electronic video image generated by a charge-coupled device (CCD) or a complementary metal oxide semiconductor (CMOS) chip in the tip of the endoscope. Operator controls permit deflection of the endoscope tip; fiberoptic bundles or light-emitting diodes provide light at the tip of the endoscope; and working channels allow washing, suctioning, and the passage of instru ments (Fig. 333-1). Progressive changes in the diameter and stiffness of endoscopes have improved the ease and patient tolerance of endos copy. High-resolution and high-definition endoscopes equipped with electronic and optical magnification capabilities enable acquisition of images with a high level of detail. Advanced imaging techniques, including narrow-band imaging (Fig. 333-2) and real-time imageprocessing enhancement algorithms, aid in tissue characterization or differentiation. ENDOSCOPIC PROCEDURES ■ ■UPPER ENDOSCOPY Upper gastrointestinal endoscopy, also referred to as esophagogastro duodenoscopy (EGD), is performed by passing a flexible endoscope through the mouth into the esophagus, stomach, and duodenum. The procedure is the best method for examining the upper gastrointestinal mucosa (Fig. 333-3). While the upper gastrointestinal radiographic series has similar accuracy for diagnosis of duodenal ulcer (Fig. 333-4), EGD is superior for detection of gastric ulcers (Fig. 333-5) and flat mucosal lesions, such as Barrett’s esophagus (Fig. 333-6), and it per mits directed biopsy and endoscopic therapy. Intravenous sedation is given to most patients in the United States to ease the anxiety and discomfort of the procedure, although in many countries, EGD is rou tinely performed with topical pharyngeal anesthesia only. Patient toler ance of unsedated EGD is improved by the use of an ultrathin, 5-mm diameter endoscope that can be passed transorally or transnasally. ■ ■COLONOSCOPY Colonoscopy is performed by passing a flexible colonoscope through the anal canal into the rectum and colon. The cecum is reached in

> 95% of cases, and the terminal ileum (Fig. 333-7) can usually be examined. Colonoscopy is the gold standard for imaging the colonic mucosa (Fig. 333-8). Colonoscopy has greater sensitivity than barium enema for the detection of colitis (Fig. 333-9), colon polyps (Fig. 333-10), and colorectal cancer (Fig. 333-11). Computed tomography (CT) colo nography rivals the accuracy of colonoscopy for the detection of some

A CHAPTER 333 Gastrointestinal Endoscopy B FIGURE 333-2 Flat colon polyp. A. White-light imaging. B. Corresponding narrowband imaging enhances mucosal features and lesion delineation. polyps and cancer, although it is not as sensitive for the detection of flat lesions, such as serrated polyps (Fig. 333-12). Intravenous sedation is usually given before colonoscopy in the United States, although a will ing patient and a skilled examiner can complete the procedure without sedation in many cases. ■ ■FLEXIBLE SIGMOIDOSCOPY Flexible sigmoidoscopy is akin to colonoscopy, but it visualizes only the rectum and a variable portion of the left colon, typically to 60 cm from the anal verge. This procedure may result in abdominal cramping and discomfort, but it is brief and thus can be performed without sedation. Flexible sigmoidoscopy is primarily used for evaluation of diarrhea and rectal outlet bleeding. ■ ■SMALL-BOWEL ENDOSCOPY Three endoscopic techniques are currently used to evaluate the small intestine, most often in patients presenting with presumed smallbowel bleeding. For capsule endoscopy, the patient swallows a dispos able capsule that contains a CMOS chip camera. Color still images (Fig. 333-13) are transmitted wirelessly to an external receiver at sev eral frames per second until the capsule's battery is exhausted or it is passed into the toilet. Capsule endoscopy enables visualization of the small-bowel mucosa beyond the reach of a conventional endoscope,

A PART 10 Disorders of the Gastrointestinal System C E FIGURE 333-3 Normal upper endoscopic examination. A. Esophagus. B. Gastroesophageal junction. C. Gastric fundus. D. Gastric body. E. Gastric antrum. F. Pylorus. G. Duodenal bulb. H. Second portion of the duodenum.

B D F

G FIGURE 333-3 (Continued) A FIGURE 333-4 Duodenal ulcers. A. Ulcer with a small, flat, pigmented spot in its base. B. Ulcer with a visible vessel (arrow) in a patient with recent hemorrhage. A FIGURE 333-5 Gastric ulcers. A. Benign gastric ulcer in the antrum. B. Malignant gastric ulcer involving greater curvature of stomach.

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A C FIGURE 333-6 Barrett's esophagus. A. Salmon-colored Barrett's mucosa extending proximally from the gastroesophageal junction. B. Barrett's esophagus with a suspicious nodule (arrow) identified during endoscopic surveillance. C. Histologic finding of intramucosal adenocarcinoma in the endoscopically resected nodule. Tumor extends into the esophageal submucosa (arrow). D. Barrett's esophagus with locally advanced adenocarcinoma. PART 10 Disorders of the Gastrointestinal System and at present, it is solely a diagnostic procedure. Patients with a history of prior intestinal surgery or Crohn's disease are at risk for capsule retention at the site of a clinically unsuspected small-bowel stricture, and ingestion of a "patency capsule" composed of radiologi cally opaque biodegradable material may be indicated before capsule endoscopy in such patients. Push enteroscopy is generally performed using a variable-stiffness pediatric or adult colonoscope, or a dedicated enteroscope with or without the assistance of a stiffening overtube that extends from the mouth to the small intestine. The proximal to mid-jejunum is usu ally reached, and the instrument channel of the endoscope allows for biopsy or endoscopic therapy. A FIGURE 333-7 Colonoscopic view of terminal ileum. A. Normal-appearing terminal ileum (TI). B. View of normal villi of TI enhanced by examination under water immersion.

B D Deeper intubation of the small bowel can be accomplished by single- or double-balloon enteroscopy, which enables pleating of the small intestine onto an overtube (Fig. 333-14, Video V5-1). With balloonassisted enteroscopy, the entire small intestine can be visualized in some patients when both the oral and anal routes of insertion are used. Biopsies and endoscopic therapy, such as thermal ablation of vascular ectasias and polypectomy, can be performed throughout the visualized small bowel (Fig. 333-15). ■ ■ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY During endoscopic retrograde cholangiopancreatography (ERCP), a side-viewing endoscope is passed through the mouth to the duodenum, B

A C FIGURE 333-8 Normal colonoscopic examination. A. Cecum with view of appendiceal orifice. B. Ileocecal valve. C. Normal-appearing colon. D. Rectum (retroflexed view). the bile duct and/or pancreatic duct is cannulated with a thin plastic catheter, and radiographic contrast material is injected under fluo roscopic guidance (Fig. 333-16). When indicated, the major papilla can be incised using the technique of endoscopic sphincterotomy (Fig. 333-17). Stones can be retrieved from the ducts, biopsies can be performed, strictures can be dilated and/or stented (Fig. 333-18), and ductal leaks can be treated (Fig. 333-19). ERCP is usually performed for therapy but is also important diagnostically as it facilitates tissue sampling of biliary or pancreatic ductal strictures. ■ ■ENDOSCOPIC ULTRASOUND Endoscopic ultrasound (EUS) utilizes ultrasound transducers incor porated into the tip of a flexible endoscope. Ultrasound images are obtained of the gut wall and adjacent organs, vessels, lymph nodes, and other structures. High-resolution images are obtained by bringing a high-frequency ultrasound transducer close to the area of interest via endoscopy. EUS provides the most accurate preoperative local stag ing of esophageal, pancreatic, and rectal malignancies (Fig. 333-20), but it does not detect distant metastases that are beyond its imaging range. EUS is also useful for diagnosis of bile duct stones, gallbladder disease, subepithelial gastrointestinal lesions, and chronic pancreatitis. Fine-needle aspirates and core biopsies of organs, masses, and lymph nodes in the posterior mediastinum, abdomen, retroperitoneum, and

B CHAPTER 333 Gastrointestinal Endoscopy D pelvis can be obtained under EUS guidance (Fig. 333-21). EUS-guided therapeutic procedures are increasingly performed, including drainage of abscesses, pseudocysts, and pancreatic necrosis into the gut lumen (Video V5-2); celiac plexus neurolysis for treatment of pancreatic pain; ethanol ablation of pancreatic neuroendocrine tumors; treatment of gastric and intestinal varices; biliary or pancreatic drainage; and endoscopic gastrojejunostomy for palliation of malignant gastric outlet obstruction (Video V5-3). ■ ■NATURAL ORIFICE TRANSLUMINAL ENDOSCOPIC SURGERY Natural orifice transluminal endoscopic surgery (NOTES) represents a collection of endoscopic methods that entail passage of an endoscope or its accessories into or through the wall of the gastrointestinal tract to perform diagnostic or therapeutic interventions. Some NOTES procedures, such as percutaneous endoscopic gastrostomy (PEG) or endoscopic necrosectomy of pancreatic necrosis, are well-established clinical procedures (Video V5-2); others such as peroral endoscopic myotomy (POEM) for achalasia (Fig. 333-22) and gastroparesis, peroral endoscopic tumorectomy (POET) (Fig. 333-23), and endo scopic full-thickness resection (EFTR) of gastrointestinal mural lesions (Fig. 333-24, Video V5-4), are newer minimally invasive therapeutic options.

A PART 10 Disorders of the Gastrointestinal System C FIGURE 333-9 Causes of colitis. A. Chronic ulcerative colitis with diffuse inflammation. B. Severe Crohn’s colitis with deep ulcers. C. Pseudomembranous colitis with yellow, adherent pseudomembranes. D. Ischemic colitis with

patchy mucosal edema, subepithelial hemorrhage, superficial ulcerations, and cyanosis. A FIGURE 333-10 Colonic polyps. A. Pedunculated polyp on a stalk. B. Sessile polyp.

B D B

FIGURE 333-11 Ulcerated colon adenocarcinoma narrowing the colonic lumen. A B C FIGURE 333-12 Flat serrated polyp in the cecum. A. Appearance of the lesion under conventional white-light imaging. B. Mucosal patterns and boundary of the lesion enhanced with narrow-band imaging. C. Submucosal lifting of the lesion with dye (methylene blue) injection before resection.

FIGURE 333-13 Capsule endoscopy. Image of a jejunal vascular ectasia. ■ ■ENDOSCOPIC RESECTION AND CLOSURE TECHNIQUES Endoscopic mucosal resection (EMR) (Fig. 333-25, Video V5-5) and endoscopic submucosal dissection (ESD) (Fig. 333-26, Video V5-6) are the two commonly used techniques for the resection of benign and early-stage malignant gastrointestinal neoplasms. In addition to pro viding larger specimens for more accurate histopathologic assessment and diagnosis, these techniques may be curative for some dysplastic lesions and superficial carcinomas involving the esophagus, stomach, and colon. CHAPTER 333 Gastrointestinal Endoscopy Several devices are available for closure of mucosal defects created by EMR and ESD, as well as gastrointestinal fistulas and perfora tions. Endoscopic clips deployed through the working channel of an FIGURE 333-14 Double-balloon enteroscopy. Radiograph of the orally inserted instrument deep in the small intestine.

A PART 10 Disorders of the Gastrointestinal System B C FIGURE 333-15 Nonsteroidal anti-inflammatory drug (NSAID)–induced proximal ileal stricture managed via double-balloon enteroscopy. A. High-grade ileal stricture causing obstructive symptoms. B. Balloon dilation of the ileal stricture. C. Appearance of the stricture after dilation.

A B FIGURE 333-16 Endoscopic retrograde cholangiopancreatography (ERCP) for bile duct stones. A. Faceted bile duct stones are demonstrated in the common bile duct and common hepatic duct. B. After endoscopic sphincterotomy, the stones are extracted with a stone extraction balloon.

A C FIGURE 333-17 Endoscopic sphincterotomy. A. A normal-appearing ampulla of Vater (arrow). B. Biliary endoscopic sphincterotomy is performed with electrosurgery. C. Bile duct stones are extracted with a balloon catheter. endoscope have been used for many years to treat bleeding lesions, and the development of larger over-the-scope clips has facilitated endoscopic closure of gastrointestinal fistulas and perforations not previously amenable to endoscopic therapy (Video V5-7). Endoscopic suturing can be used to close some perforations and large defects (Fig. 333-27), anastomotic leaks, and fistulas. Endoscopic suturing may also be used to prevent stent migration (Fig. 333-28, Video V5-8) and to perform endoscopic bariatric procedures. These technologies are play ing an expanding role in patient care. RISKS OF ENDOSCOPY Medications used during sedation may cause respiratory depression or allergic reactions. All endoscopic procedures carry some risk of bleed ing and gastrointestinal perforation. The risk is small with diagnostic

B CHAPTER 333 Gastrointestinal Endoscopy upper endoscopy, flexible sigmoidoscopy, and colonoscopy (<1:1000 procedures), but it ranges from 0.5 to 5% when therapeutic maneuvers such as polypectomy, EMR, ESD, control of hemorrhage, or stricture dilation are performed. The risk of

adverse events for diagnostic EUS (without needle aspiration) is similar to that for diagnostic upper endoscopy. Infectious complications are uncommon with most endoscopic procedures. Some procedures carry a higher incidence of postproce dural bacteremia, and prophylactic antibiotics may be indicated (Table 333-1). Management of antithrombotic agents before endoscopic pro cedures should take into account the procedural risk of hemorrhage, the agent, and the patient condition, as summarized in Table 333-2. ERCP carries additional risks. Pancreatitis occurs in ~5% of patients undergoing the procedure, and young, anicteric patients with normal

A PART 10 Disorders of the Gastrointestinal System C FIGURE 333-18 Endoscopic diagnosis, staging, and palliation of hilar cholangiocarcinoma. A. Endoscopic retrograde cholangiopancreatography (ERCP) in a patient with obstructive jaundice demonstrates a malignant-appearing stricture of the biliary confluence extending into the left and right intrahepatic ducts. B. Per oral cholangioscopy demonstrating a stricture with dilated, tortuous vessels with a malignant appearance. C. Intraductal biopsy obtained during ERCP demonstrates malignant cells infiltrating the submucosa of the bile duct wall (arrow). (Image courtesy of Dr. Thomas Smyrk.) D. Endoscopic placement of multiple plastic stents draining the right anterior, right posterior, and left systems relieves the biliary obstruction. ducts are at increased risk (up to 25%). Post-ERCP pancreatitis is usually mild and self-limited, but it may result in prolonged hospital ization, surgery, diabetes, or death when severe. Significant bleeding occurs after endoscopic sphincterotomy in ~1% of cases. Ascending cholangitis, pseudocyst infection, duodenal perforation, and abscess formation may occur as a result of ERCP. PEG tube placement during EGD is associated with a 10–15% inci dence of adverse events, most often wound infections. Fasciitis, pneu monia, bleeding (Fig. 333-29), buried bumper syndrome (Fig. 333-30), and colonic injury may result from PEG tube placement.

B D URGENT ENDOSCOPY ■ ■ACUTE GASTROINTESTINAL HEMORRHAGE Endoscopy is the primary diagnostic and therapeutic procedure for patients with acute gastrointestinal hemorrhage. Although gastroin testinal bleeding stops spontaneously in most cases, some patients will have persistent or recurrent hemorrhage that may be life-threatening. Clinical predictors of rebleeding help identify patients most likely to benefit from urgent endoscopy and endoscopic, angiographic, or surgi cal hemostasis.

A FIGURE 333-19 Bile leak. A. Site of leak (arrow) from the cystic duct after laparoscopic cholecystectomy. B. Contrast leaks from the cystic duct stump across surgical clips into the gallbladder fossa (arrow). A FIGURE 333-20 Local staging of gastrointestinal cancers with endoscopic ultrasound. In each example, the arrowhead marks the primary tumor and the arrow indicates the muscularis propria (MP) of the intestinal wall. A. T2 gastric cancer. The tumor invades the MP. B. Submucosal gastric tumor. The tumor is confined to the submucosal space without invasion into the MP. A FIGURE 333-21 Endoscopic ultrasound (EUS)–guided tissue sampling. A. Ultrasound image of a 22-gauge needle (arrow) passed through the gastric wall and positioned in a hypoechoic pancreatic neck mass. B. Touch preparation demonstrating aspirated malignant cells.

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A B D E PART 10 Disorders of the Gastrointestinal System H G FIGURE 333-22 Peroral endoscopic myotomy (POEM) for achalasia. A. Dilated aperistaltic esophagus with retained secretions. B. Hypertonic lower esophageal sphincter (LES) region. C. Mucosal incision (mucosotomy) 10 cm

proximal to the LES. D. Submucosal dissection using an electrosurgical knife following endoscope entry through the mucosotomy site into the submucosal space. E. Completion of submucosal tunnel to the cardia. F. Initiation of myotomy of the muscularis propria distal to the mucosotomy site. G. Completion of myotomy to the cardia. H. Closure of mucosotomy site with clips. I. Patulous gastroesophageal junction following myotomy. Initial Evaluation The initial evaluation of the bleeding patient focuses on the severity of hemorrhage as reflected by the presence of supine hypotension or tachycardia, postural vital sign changes, and the frequency of hematemesis or melena. Decreases in hematocrit and hemoglobin lag behind the clinical course and are not reliable gauges of the magnitude of acute bleeding. Nasogastric tube aspiration and lavage can also be used to judge the severity of bleeding, but these are no longer routinely performed for this purpose. The bedside initial evaluation, completed well before the bleeding source is confidently identified, guides immediate supportive care of the patient; triage to outpatient follow-up, a hospital ward, or an intensive care unit; and timing of endoscopy. The severity of the initial hemorrhage is the most important indication for urgent endoscopy, since a large initial bleed increases the likelihood of ongoing or recurrent bleeding. Patients with resting hypotension or orthostatic change in vital signs, repeated hematemesis, bloody nasogastric aspirate that does not clear with large-volume lavage, or those requiring blood transfusions should be considered for urgent endoscopy within 12–24 h of presentation. In addition, patients with cirrhosis, coagulopathy, or respiratory or renal failure and those >70 years old are more likely to have significant rebleeding and to benefit from prompt evaluation and treatment.

C F I Bedside evaluation also suggests an upper or lower gastrointestinal source of bleeding in most patients. Over 90% of patients with melena are bleeding proximal to the ligament of Treitz, and ~85% of patients with hematochezia are bleeding from the colon. Melena can result from bleeding in the small bowel or right colon, especially in older patients with slow colonic transit. Conversely, some patients with massive hematochezia may be bleeding from an upper gastrointestinal source, with rapid intestinal transit. An urgent upper endoscopy should be considered in such patients. Endoscopy should be performed after the patient has been resus citated with intravenous fluids and transfusions, as necessary. Marked coagulopathy or thrombocytopenia is usually treated before endoscopy, since correction of these abnormalities may lead to resolution of bleed ing, and techniques for endoscopic hemostasis are limited in such patients. Metabolic derangements should also be addressed. Tracheal intubation for airway protection should be considered before upper endoscopy in patients with repeated recent hematemesis, particularly in those with suspected variceal hemorrhage. A single dose of erythromy cin (3–4 mg/kg or 250 mg) administered intravenously 30–90 min before upper endoscopy increases gastric emptying and may clear blood and clots from the stomach to improve endoscopic visualization.

A C E G FIGURE 333-23 Peroral endoscopic tumorectomy (POET). A. Mid-esophageal subepithelial lesion (arrow). B. Mucosal incision (mucosotomy) 5 cm proximal to the lesion. C. Submucosal dissection and tunneling to the site of the lesion. D. Dissection of the lesion from its attachment to the muscularis propria. E. Postresection defect through the muscularis propria. F. Mucosotomy site. G. Closure of mucosotomy site with clips. H. Resected specimen (leiomyoma).

A C D PART 10 Disorders of the Gastrointestinal System FIGURE 333-24 Endoscopic full-thickness resection (EFTR) of a gastrointestinal stromal tumor. A. Subepithelial lesion in the proximal stomach. B. Hypoechoic lesion arising from the fourth layer (muscularis propria) at endoscopic ultrasound. C. Full-thickness resection defect. D. Closure of defect using an over-the-scope clip. Most patients with hematochezia who are otherwise stable can undergo semi-elective colonoscopy. Controlled trials have not shown a benefit to urgent colonoscopy (within 24 h of presentation) in patients hospitalized with hematochezia, although selected patients with mas sive or recurrent large-volume episodes of hematochezia should prob ably undergo urgent colonoscopy after both upper endoscopy and a rapid colonic purge with an oral polyethylene glycol solution. Colo noscopy has a higher diagnostic yield than radionuclide bleeding scans or catheter-based angiography in lower gastrointestinal bleeding, and endoscopic therapy can be applied in some cases. Urgent colonoscopy A FIGURE 333-25 Endoscopic mucosal resection (EMR). A. Large sessile polypoid fold in the transverse colon. B. Lifting of lesion following submucosal fluid injection. C. Piecemeal hot snare resection. D. Initial resection site. E. Resection defect following completion of piecemeal EMR.

B can be hindered by poor visualization due to persistent vigorous bleed ing with recurrent hemodynamic instability, and other techniques (e.g., angiography or even emergent subtotal colectomy) must be employed. The anal and rectal mucosa should also be visualized endoscopically early in the course of massive rectal bleeding, as bleeding lesions in or close to the anal canal may be identified that are amenable to endo scopic or surgical transanal hemostatic techniques. Peptic Ulcer The endoscopic appearance of peptic ulcers provides useful prognostic information and guides the need for endoscopic B

C E FIGURE 333-25 (Continued) A FIGURE 333-26 Endoscopic submucosal dissection (ESD). A. Large, flat, distal rectal adenoma. B. Circumferential incision following submucosal fluid injection at the periphery of the lesion. C. ESD using an electrosurgical knife. D. Rectal defect following ESD. E. Specimen resected en bloc.

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PART 10 Disorders of the Gastrointestinal System FIGURE 333-27 Closure of large defect using an endoscopic suturing device. A. Ulcerated inflammatory fibroid polyp in the antrum. B. Large defect following endoscopic submucosal dissection of the lesion. C. Closure of the defect using endoscopic sutures (arrows). D. Resected specimen. C D E A B FIGURE 333-26 (Continued)

C FIGURE 333-27 (Continued) therapy in patients with acute hemorrhage (Fig. 333-31). A cleanbased ulcer is associated with a low risk (3–5%) of rebleeding; patients with melena and a clean-based ulcer may be discharged home from the emergency room or endoscopy suite if they are young, reliable, otherwise healthy, and able to return as needed. Flat pigmented spots and adherent clots covering the ulcer base have a 10% and 20% risk of rebleeding, respectively. Flat pigmented spots do not require treatment, but endoscopic therapy is often applied to an ulcer with an adherent clot. When a fibrin plug is seen protruding from a vessel wall in the base of an ulcer (so-called sentinel clot or visible vessel), the risk of rebleeding from the ulcer approximates 40%. This finding typically leads to endoscopic therapy to decrease the rebleeding rate. When A C FIGURE 333-28 Prevention of stent migration using endoscopic sutures. A. Esophagogastric

anastomotic stricture refractory to balloon dilation. B. Temporary placement of a covered esophageal stent. C. Endoscopic suturing device to anchor the stent to the esophageal wall. D. Stent fixation with endoscopic sutures (arrows).

D active spurting from an ulcer is seen, there is a 90% risk of ongoing bleeding without endoscopic or surgical therapy. Endoscopic therapy of ulcers with high-risk stigmata typically lowers the rebleeding rate to 5–10%. Several hemostatic techniques are available, including injection of epinephrine or a sclerosant into and around the vessel (Fig. 333-32), “coaptive coagulation” of the vessel in the base of the ulcer using a thermal probe that is pressed against the site of bleeding (Fig. 333-33), placement of through-thescope clips (Fig. 333-34) or an over-the-scope clip (Fig. 333-35), application of a hemostatic powder or gel, or a combination of these modalities (Video V5-9). Epinephrine injection can slow or stop active bleeding, but it is not a stand-alone technique for definitive CHAPTER 333 Gastrointestinal Endoscopy B D

TABLE 333-1 Antibiotic Prophylaxis for Endoscopic Procedures PATIENT CONDITION PROCEDURE CONTEMPLATED GOAL OF PROPHYLAXIS All cardiac conditions Any endoscopic procedure Prevention of infective endocarditis Not recommended Bile duct obstruction in the absence of cholangitis ERCP with complete drainage Prevention of cholangitis Not recommended Bile duct obstruction in the absence of cholangitis ERCP with anticipated incomplete drainage (e.g., sclerosing cholangitis, hilar strictures) Sterile pancreatic fluid collection (e.g., pseudocyst, necrosis), which communicates with pancreatic duct ERCP Prevention of cyst infection Recommended; continue antibiotics after the procedure Sterile pancreatic fluid collection Transmural drainage Prevention of cyst infection Recommended Solid lesion along upper GI tract EUS-FNA or FNB Prevention of local infection Not recommendeda Solid lesion along lower GI tract EUS-FNA or FNB Prevention of local infection Not recommendeda Cystic lesions along GI tract (including mediastinum and pancreas) EUS-FNA or FNB Prevention of cyst infection Recommended All patients Percutaneous endoscopic feeding tube placement Cirrhosis with acute GI bleeding Recommended for all such patients, regardless of endoscopic procedures Continuous peritoneal dialysis Lower GI tract endoscopy Prevention of bacterial peritonitis Recommended Synthetic vascular graft and other nonvalvular cardiovascular devices Any endoscopic procedure Prevention of graft and device infection Not recommendedd Prosthetic joints Any endoscopic procedure Prevention of septic arthritis Not recommendedd aLow rates of bacteremia and local infection. bCefazolin or an antibiotic with equivalent coverage of oral and skin flora. cRisk for bacterial infection associated with cirrhosis and GI bleeding is well established; ceftriaxone or a quinolone antibiotic recommended. dVery low risk of infection. Abbreviations: ERCP, endoscopic retrograde cholangiopancreatography; EUS-FNA, endoscopic ultrasound–fine-needle aspiration; EUS-FNB, endoscopic ultrasound–fine needle biopsy; GI, gastrointestinal. Source: Reproduced with permission from MA Kashab et al: Antibiotic prophylaxis for GI endoscopy. Gastrointest Endosc 81:81, 2015. PART 10 Disorders of the Gastrointestinal System hemostasis. In conjunction with endoscopic therapy, the administra tion of a proton pump inhibitor decreases the risk of rebleeding and improves patient outcome. Varices Two complementary strategies guide therapy of bleeding varices: local treatment of the bleeding varices and treatment of the underlying portal hypertension. Local therapies, including endoscopic variceal band ligation, endoscopic variceal sclerotherapy, stent place ment, and tamponade with a stent or Sengstaken-Blakemore tube, effectively control acute hemorrhage in most patients, although thera pies that decrease portal pressure (pharmacologic treatment, surgical shunts, or radiologically placed transjugular

intrahepatic portosys temic shunts) also play an important role. Endoscopic variceal ligation (EVL) is indicated for the prevention of a first bleed (primary prophylaxis) from large esophageal varices (Fig. 333-36), particularly in patients in whom nonselective beta blockers are contraindicated or not tolerated. EVL is also the preferred endoscopic therapy for control of active esophageal variceal bleeding and for subsequent eradication of esophageal varices (secondary pro phylaxis). During EVL, a varix is suctioned into a cap fitted at the tip of the endoscope, and a rubber band is released from the cap, ligating the varix (Fig. 333-37, Video V5-10). EVL controls acute hemorrhage in up to 90% of patients. Complications of EVL, such as postligation ulcer bleeding and esophageal stenosis, are uncommon. Endoscopic variceal sclerotherapy (EVS) involves the injection of a sclerosing, thrombogenic solution into or next to esophageal varices. EVS also controls acute hemorrhage in most patients, but due to its higher complication rate, it is generally used as salvage therapy when band ligation fails. Bleeding from large gastric fundal varices (Fig. 333-38) is best treated with endoscopic cyanoacrylate (“glue”) injection (Video V5-11) or EUS-guided coil placement and cyanoacrylate injection, since EVL or EVS of these varices is associated with a high rebleeding rate. Complications of cyanoacrylate injection include infection and glue embolization to other organs, such as the lungs, brain, and spleen. After treatment of the acute hemorrhage, an elective course of endoscopic therapy can be undertaken with the goal of eradicating

PERIPROCEDURAL ANTIBIOTIC PROPHYLAXIS Prevention of cholangitis Recommended; continue antibiotics after the procedure Prevention of peristomal infection Recommendedb Prevention of infectious complications and reduction of mortality Recommended, upon admissionc esophageal varices and preventing rebleeding months to years later. However, this chronic therapy is less successful, preventing long-term rebleeding in ~50% of patients. Pharmacologic therapies that decrease portal pressure have similar efficacy. The preferred strategy, however, for secondary prophylaxis of variceal bleeding is the combination of EVL with a nonselective beta blocker. Dieulafoy’s Lesion This lesion, also called persistent caliber artery, is a large-caliber arteriole that runs immediately beneath the gastrointestinal epithelium and bleeds through a focal mucosal ero sion (Fig. 333-39). Dieulafoy’s lesion commonly involves the lesser curvature of the proximal stomach, causes impressive arterial hemor rhage, and may be difficult to diagnose when not actively bleeding; it is often recognized only after repeated endoscopy for recurrent bleeding. Endoscopic therapy, such as thermal coagulation, band ligation, clip placement, or endoscopic suturing, is typically effective for control of bleeding and sealing of the underlying vessel once the lesion has been identified (Video V5-12). Rescue therapies, such as angiographic embolization or surgical oversewing, are considered in situations where endoscopic therapy has failed. Mallory-Weiss Tear A Mallory-Weiss tear is a linear mucosal rent near or across the gastroesophageal junction that is often associated with retching or vomiting (Fig. 333-40). When the tear disrupts a submucosal arteriole, brisk hemorrhage may result. Endoscopy is the best method for diagnosis, and an actively bleeding tear can be treated endoscopically with coaptive coagulation, band ligation, or clip place ment, with or without epinephrine injection (Video V5-13). Unlike peptic ulcer, a Mallory-Weiss tear with a nonbleeding sentinel clot in its base rarely rebleeds and thus does not necessitate endoscopic therapy. Vascular Ectasias Vascular ectasias are flat mucosal vascular anomalies that are best diagnosed by endoscopy. They usually cause slow intestinal blood loss and occur either in a sporadic fashion or in a well-defined pattern of distribution (e.g., gastric antral vascular ectasia [GAVE] or “watermelon stomach”) (Fig. 333-41). Cecal vascular ecta sias, GAVE, and radiation-induced rectal ectasias are often responsive

TABLE 333-2 Management of Antithrombotic Drugs Prior to Endoscopic Procedures BLEEDING RISK OF PROCEDURE MANAGEMENT DRUG Warfarin Lowa Continue N/A Ensure that INR is not supratherapeutic Highb Discontinue 3–7 days (usually 5), INR should be ≤1.5 for procedure Dabigatran, rivaroxaban, apixaban, edoxaban Lowa Hold morning dose on day of procedure Dabigatran Highb Discontinue 2–3 days if GFR is ≥50 mL/min, 4–5 days if GFR is 30–49 mL/min Rivaroxaban, apixaban, edoxaban Higha Discontinue 2 days if GFR is ≥60 mL/min, 3 days if GFR is 30–59 mL/min, 4 days if GFR is <30 mL/min Heparin Lowa Continue N/A Highb Discontinue 4–6 h for unfractionated heparin Skip one dose if using low-molecular-weight heparin Aspirin Any Continue N/A Low-dose aspirin does not substantially increase the risk of endoscopic procedures Aspirin with dipyridamole Lowa Continue N/A Highb Discontinue 2–7 days Consider continuing aspirin monotherapy P2Y12 receptor antagonists (clopidogrel, prasugrel, ticlopidine, ticagrelor, cangrelor) Lowa Continue Coronary stent in place: discuss with cardiologist No coronary stent: discontinue, consider substituting aspirin Highb aLow-risk endoscopic procedures include esophagogastroduodenoscopy (EGD) or colonoscopy with or without biopsy, endoscopic ultrasound (EUS) without fine-needle aspiration (FNA), and endoscopic retrograde cholangiopancreatography (ERCP) with stent exchange. bHigh-risk endoscopic procedures include EGD or colonoscopy with dilation, polypectomy, or thermal ablation; percutaneous endoscopic gastrostomy (PEG); EUS with FNA; and ERCP with sphincterotomy or pseudocyst drainage. cBridging therapy with low-molecular-weight heparin should be considered for patients discontinuing warfarin who are at high risk for thromboembolism, including those with (1) prosthetic metal heart valve, (2) atrial fibrillation with a CHA2DS2-VASc score ≥3, mitral stenosis, prosthetic valve or history of stroke or transient ischemic attack; (3) mechanical mitral valve; (4) mechanical aortic valve with other thromboembolic risk factors or older-generation mechanical aortic valve; or (5) venous thromboembolism (VTE) within the past 3 months. Abbreviations: GFR, glomerular filtration rate; GI, gastrointestinal; INR, international normalized ratio; N/A, not applicable. Source: Adapted from RD Acosta et al: Gastrointest Endosc 83:3, 2016; and AM Veitch et al: Gut 70:1611, 2021. A FIGURE 333-29 Bleeding from percutaneous endoscopic gastrostomy (PEG) tube placement. A. Patient with melena from a recently placed PEG tube. B. Loosening of the internal disk bumper of the PEG tube revealed active bleeding from within the PEG tract.

INTERVAL BETWEEN LAST DOSE AND PROCEDURE COMMENTS Consider bridging therapy with low-molecular-weight heparin for patients at high risk of thrombosisc; usually safe to resume warfarin on the same or next day For life-threatening GI hemorrhage, consider reversal with unactivated prothrombin complex concentrate N/A Bridging therapy not recommended; resume drug when bleeding risk is low For life-threatening GI hemorrhage, consider use of a reversal agent Bridging therapy not recommended; resume drug when bleeding risk is low For life-threatening GI hemorrhage, consider use of a reversal agent N/A 5 days (clopidogrel or ticagrelor), 7 days (prasugrel), 10–14 days (ticlopidine) Risk of stent thrombosis for at least 12 months after insertion of drug-eluting coronary stent or 1 month after insertion of bare metal coronary stent CHAPTER 333 Gastrointestinal Endoscopy B

A FIGURE 333-30 Buried bumper syndrome. A. Migration of the internal disk bumper of a percutaneous endoscopic gastrostomy (PEG) tube through the gastric wall. B. Close-up view of the disk bumper (arrow) buried in the gastric wall. to local endoscopic ablative therapy, such as argon plasma coagulation (Video V5-14). Patients with diffuse small-bowel vascular ectasias (associated with chronic renal failure and with hereditary hemorrhagic telangiectasia) may continue to bleed

despite endoscopic treatment of easily accessible lesions by conventional endoscopy. These patients may benefit from deep enteroscopy with endoscopic hemostasis, or pharmacologic therapy, such as octreotide or low-dose thalidomide, in those who continue to bleed despite endoscopic therapy. PART 10 Disorders of the Gastrointestinal System Colonic Diverticula Diverticula form where nutrient arteries penetrate the muscular wall of the colon en route to the colonic mucosa (Fig. 333-42). The artery found in the base of a diverticulum may bleed, causing painless and impressive hematochezia. Colonoscopy is indicated in patients with hematochezia and suspected diverticular hemorrhage, since other causes of bleeding (e.g., vascular ectasias, colitis, and colon cancer) must be excluded. In addition, an actively A FIGURE 333-31 Stigmata of hemorrhage in peptic ulcers. A. Gastric antral ulcer with a clean base. B. Duodenal ulcer with flat pigmented spots (arrows). C. Duodenal ulcer with a dense adherent clot. D. Duodenal ulcer with a pigmented protuberance/visible vessel (arrow). E. Duodenal ulcer with active spurting (arrow).

B bleeding diverticulum may be seen and treated during colonoscopy (Fig. 333-43, Video V5-15). ■ ■GASTROINTESTINAL OBSTRUCTION AND PSEUDOOBSTRUCTION Endoscopy is useful for evaluation and treatment of some forms of gastrointestinal obstruction. An important exception is small-bowel obstruction due to surgical adhesions, which is generally not diagnosed or treated endoscopically. Esophageal, gastroduodenal, and colonic obstruction or pseudoobstruction can all be diagnosed and often man aged endoscopically. Acute Esophageal Obstruction Esophageal obstruction by impacted food (Fig. 333-44) or an ingested foreign body (Fig. 333-45) is a potentially life-threatening event and represents an endoscopic emer gency. Left untreated, the patient may develop esophageal ulceration, B

C D E FIGURE 333-31 (Continued) FIGURE 333-32 Injection therapy for ulcer hemostasis. Epinephrine injection into a duodenal ulcer with visible vessel (arrow) and adherent clot.

CHAPTER 333 Gastrointestinal Endoscopy ischemia, and perforation. Patients with persistent esophageal obstruc tion often have hypersalivation and are usually unable to swallow water. Sips of a carbonated beverage, sublingual nifedipine or nitrates, or intravenous glucagon may resolve an esophageal food impaction, but in many patients, an underlying web, ring, or stricture is present, and endoscopic removal of the obstructing food bolus is necessary. Endoscopy is generally the best initial test in such patients since endo scopic removal of the obstructing material is usually possible, and the presence of an underlying esophageal pathology can often be deter mined. Radiographs of the chest and neck should be considered before endoscopy in patients with fever, obstruction for ≥24 h, or ingestion of a sharp object, such as a fishbone. Radiographic contrast studies inter fere with subsequent endoscopy and are not advisable in most patients with a clinical picture of esophageal obstruction. Gastric Outlet Obstruction Obstruction of the gastric outlet is commonly caused by gastric, duodenal, or pancreatic malignancy or chronic peptic ulceration with stenosis of the pylorus (Fig. 333-46). Patients vomit partially digested food many hours after eating. Gas tric decompression with a nasogastric tube and subsequent lavage for removal of retained material is the first step in treatment. Endoscopy is useful for diagnosis and treatment. Patients with benign pyloric steno sis may be treated with endoscopic balloon dilation of the pylorus, and a course of endoscopic dilation results in long-term relief of symptoms

PART 10 Disorders of the Gastrointestinal System A B C A B FIGURE 333-33 Contact coagulation for ulcer hemostasis. A. Duodenal ulcer with a visible vessel (arrow). B. Coagulation of the vessel with

a contact thermal probe. C. Obliteration of the treated vessel (arrow). FIGURE 333-34 Through-the-scope clip placement for ulcer hemostasis. A. Superficial duodenal ulcer with visible vessel (arrow). B. Hemostasis secured following placement of multiple through-the-scope clips.

A B FIGURE 333-35 Over-the-scope clip placement for ulcer hemostasis. A. Pyloric channel ulcer with visible vessel (arrow). B. Hemostasis secured following placement of an over-the-scope clip. in ~50% of patients. Removable, fully covered lumen-apposing metal stents (LAMS) may also be used to treat benign pyloric stenosis (Video V5-16). Malignant gastric outlet obstruction can be relieved with endoscopically placed expandable stents across the obstruction in patients with inoperable malignancy (Video V5-17) or by EUS-guided gastroenterostomy to bypass the obstruction (Video V5-3). Colonic Obstruction and Pseudoobstruction These con ditions both present with abdominal distention and discomfort, tympany, and a dilated colon on plain abdominal radiography. The radiographic appearance may be characteristic of a particular condition, such as sigmoid volvulus (Fig. 333-47). Both obstruc tion and pseudoobstruction may lead to colonic perforation if left untreated. Acute colonic pseudoobstruction is a form of colonic FIGURE 333-36 Esophageal varices.

A CHAPTER 333 Gastrointestinal Endoscopy B FIGURE 333-37 Endoscopic variceal ligation. A. Esophageal varices with red wale marks. B. Band ligation of varices. ileus that is usually attributable to electrolyte disorders, narcotic and anticholinergic medications, immobility (as after surgery), or retroperitoneal hemorrhage or mass. Multiple causative factors are often present. Colonoscopy, water-soluble contrast enema, or CT may be used to assess for an obstructing lesion and differentiate obstruction from pseudoobstruction. One of these diagnostic studies should be strongly considered if the patient does not have clear risk factors for pseudoobstruction, if radiographs do not show air in the rectum, or if the patient fails to improve when underlying causes of pseudoobstruction have been addressed. The risk of cecal perforation in pseudoobstruction rises when the cecal diameter exceeds 12 cm, and decompression of the colon may be achieved using intravenous neostigmine or via colonoscopic decompression (Fig. 333-48). Most patients should receive a trial of conservative therapy (with correc tion of electrolyte disorders, discontinuation of offending medica tions, and increased mobilization) before undergoing an invasive decompressive procedure for colonic pseudoobstruction. Acute colonic obstruction is an indication for urgent intervention. In the past, emergent diverting colostomy was usually performed with a subsequent second operation after bowel preparation to treat the underlying cause of obstruction. Colonoscopic placement of an

PART 10 Disorders of the Gastrointestinal System A B C A B FIGURE 333-39 Dieulafoy’s lesion. A. Actively spurting gastric Dieulafoy’s lesion. B. Coagulation of the lesion using a contact thermal probe. C. Hemostasis secured following contact coagulation (arrow). D. Histology of a gastric Dieulafoy’s lesion. A persistent caliber artery (arrows) is present in the gastric submucosa, immediately beneath the mucosa. FIGURE 333-38 Gastric varices. A. Large gastric fundal varices with stigmata of recent bleeding (arrow). B. Injection of cyanoacrylate (glue) into the culprit gastric varix. C. Obliterated varix following glue injection on endoscopic follow-up at 1 month (arrow).

C FIGURE 333-39 (Continued) expandable stent is an alternative treatment option that can relieve malignant colonic obstruction without emergency surgery and permit bowel preparation for an elective one-stage operation (Fig. 333-49, Video V5-18). ■ ■ACUTE BILIARY OBSTRUCTION The steady, severe pain that occurs when a gallstone acutely obstructs the common bile duct often

brings patients to seek medical atten tion. The diagnosis of a ductal stone is suspected when the patient is jaundiced or when serum liver tests or pancreatic enzyme levels are elevated; it is confirmed by transabdominal ultrasound, EUS, magnetic resonance cholangiopancreatography (MRCP), or direct cholangiog raphy (performed endoscopically, percutaneously, or during surgery). ERCP is the primary means of treating common bile duct stones (Figs. 333-16 and 333-17), although they can also be removed by bile duct exploration at the time of cholecystectomy. Radiologic percutaneous biliary drainage may be required in some cases. Bile Duct Imaging While transabdominal ultrasound diagnoses only a minority of bile duct stones, MRCP and EUS are >90% accurate and have an important role in diagnosis. Examples of these modalities are shown in Fig. 333-50. FIGURE 333-40 Mallory-Weiss tear with an adherent clot at the gastroesophageal junction following forceful retching and vomiting.

D If the suspicion for a bile duct stone is high and urgent treatment is required (as in a patient with obstructive jaundice and biliary sepsis), ERCP is the procedure of choice since it remains the gold standard for diagnosis and allows for immediate treatment (Video V5-19). If a persistent bile duct stone is relatively unlikely (as in a patient with gallstone pancreatitis), ERCP may be supplanted by less invasive imag ing techniques, such as EUS, MRCP, or intraoperative cholangiography performed during cholecystectomy, sparing some patients the risk and discomfort of ERCP. CHAPTER 333 Gastrointestinal Endoscopy Ascending Cholangitis Charcot’s triad of jaundice, abdominal pain, and fever is present in ~70% of patients with ascending cholan gitis and biliary sepsis. These patients are managed initially with fluid resuscitation and intravenous antibiotics. Abdominal ultrasound is often performed to assess for gallbladder stones and bile duct dila tion. However, the bile duct may not be dilated early in the course of acute biliary obstruction. Medical management usually improves the patient’s clinical status, providing a window of ~24 h during which biliary drainage should be established, typically by ERCP. Undue delay can result in recrudescence of overt sepsis and increased mor bidity and mortality rates. In addition to Charcot’s triad, the presence of shock and confusion (Reynolds’s pentad) is associated with a high mortality rate and should prompt urgent intervention to restore biliary drainage. Gallstone Pancreatitis Gallstones may cause acute pancreatitis as they pass through the ampulla of Vater. The occurrence of gallstone pancreatitis usually implies passage of a stone into the duodenum, and only ~20% of patients harbor a persistent stone in the ampulla or the common bile duct. Retained stones are more common in patients with jaundice, rising serum liver tests following hospitalization, severe pan creatitis, or superimposed ascending cholangitis. Urgent ERCP decreases the morbidity rate of gallstone pancreati tis in a subset of patients with retained bile duct stones. It is unclear whether the benefit of ERCP is mainly attributable to treatment and prevention of ascending cholangitis or to relief of pancreatic duc tal obstruction. ERCP is warranted early in the course of gallstone pancreatitis if ascending cholangitis is suspected, especially in a jaundiced patient. Urgent ERCP may also benefit patients predicted to have severe pancreatitis using a clinical index of severity, such as the Glasgow or Ranson score. Since the benefit of ERCP is limited to patients with a retained bile duct stone, a strategy of initial MRCP or EUS for diagnosis decreases the utilization of ERCP in gallstone pan creatitis and improves clinical outcomes by limiting the occurrence of ERCP-related adverse events.

PART 10 Disorders of the Gastrointestinal System A B C FIGURE 333-41 Gastrointestinal vascular ectasias. A. Gastric antral vascular ectasia (“watermelon stomach”) characterized by stripes of prominent flat or raised vascular ectasias. B. Cecal vascular ectasia. C. Radiation-induced vascular

ectasias of the rectum in a patient previously treated for prostate cancer. ELECTIVE ENDOSCOPY ■ ■DYSPEPSIA Dyspepsia is a chronic or recurrent burning discomfort or pain in the upper abdomen that may be caused by diverse processes, such as gastroesophageal reflux, peptic ulcer disease, and “nonulcer dyspepsia,” a heterogeneous category that includes disorders of motility, sensa tion, and somatization. Gastric and esophageal malignancies are less common causes of dyspepsia. Careful history-taking allows accurate differential diagnosis of dyspepsia in only about half of patients. In the remainder, endoscopy can be a useful diagnostic tool, especially in patients whose symptoms are not resolved by Helicobacter pylori treatment or an empirical trial of acid-reducing therapy. Endoscopy should be performed at the outset in patients with dyspepsia and alarm features, such as weight loss, obstructive symptoms, or iron-deficiency anemia. ■ ■GASTROESOPHAGEAL REFLUX DISEASE When classic symptoms of gastroesophageal reflux are present, such as water brash and substernal heartburn, presumptive diagnosis and empirical treatment are often sufficient. Endoscopy is a sensitive test for diagnosis of esophagitis (Fig. 333-51), but it will miss nonero sive reflux disease (NERD) since some patients have symptomatic reflux without esophagitis. The most sensitive test for diagnosis of gastroesophageal reflux disease (GERD) is 24-h ambulatory pH and impedance monitoring. Endoscopy is indicated in patients with reflux symptoms refractory to antisecretory therapy; in those with alarm symptoms, such as dysphagia, weight loss, or gastrointestinal bleed ing; and in those with recurrent dyspepsia after treatment that is not clearly due to reflux on clinical grounds alone. Endoscopy should be considered in patients with long-standing GERD, as they have a sixfold increased risk of harboring Barrett’s esophagus compared to patients with <1 year of reflux symptoms.

FIGURE 333-42 Colonic diverticula. Barrett’s Esophagus and Esophageal Squamous Dysplasia

Barrett’s esophagus is specialized columnar metaplasia that replaces the normal squamous mucosa of the distal esophagus in some persons with GERD. Barrett’s epithelium is a major risk factor for adenocarci noma of the esophagus and is readily detected endoscopically, due to proximal displacement of the squamocolumnar junction (Fig. 333-6). A screening EGD for Barrett’s esophagus should be considered in patients with a chronic (≥10 year) history of GERD symptoms, even if their symptoms have been mild. Endoscopic biopsy is the gold standard for confirmation of Barrett’s esophagus and for dysplasia or cancer arising in Barrett’s mucosa. Periodic EGD with biopsies is recommended for surveillance of patients with Barrett’s esophagus. Endoscopic resection (EMR or ESD) and/or ablation are treatment options when high-grade dysplasia or intramucosal cancer are found in the Barrett’s mucosa. Both endo scopic therapy and periodic surveillance are acceptable options in patients with Barrett’s esophagus and low-grade dysplasia. Radiofre quency ablation (RFA) is the most common ablative modality used for endoscopic treatment of Barrett’s esophagus, and other modalities, such as cryotherapy, are also available. Esophageal squamous dysplasia is the precursor lesion of esophageal squamous cell cancer (ESCC), the most common type of esophageal malignancy worldwide. Endoscopic detection of esophageal squa mous dysplasia often requires specialized imaging methods, such as chromoendoscopy with Lugol’s iodine solution. Once detected, it can be treated endoscopically with EMR, ESD, or RFA (Fig. 333-52). Pop ulation-based screening for esophageal squamous dysplasia has been shown to decrease the occurrence of ESCC in high-incidence regions. ■ ■PEPTIC ULCER Peptic ulcer classically causes epigastric gnawing or burning, often occurring nocturnally and promptly relieved by food or antacids. Although endoscopy is the most sensitive diagnostic test for peptic ulcer, it is not a cost-effective strategy in young patients with ulcer-like

dyspeptic symptoms unless endoscopy is available at low cost. Patients with suspected peptic ulcer should be evaluated for H. pylori infection. Serology (which diagnoses past or current infection), urea breath test ing (current infection), and stool tests (current infection) are noninva sive and less costly than endoscopy with biopsy. Patients aged >50 and those with alarm symptoms or persistent symptoms despite treatment should undergo endoscopy to exclude malignancy. ■ ■NONULCER DYSPEPSIA Nonulcer dyspepsia may be associated with bloating and, unlike peptic ulcer, tends not to remit and recur. Most patients describe persis tent symptoms despite acid-reducing, prokinetic, or anti-Helicobacter

A CHAPTER 333 Gastrointestinal Endoscopy B C FIGURE 333-43 Diverticular hemorrhage. A. Actively bleeding sigmoid diverticulum. B. Treatment of the bleeding vessel at the dome of the diverticulum with a contact thermal probe. C. Hemostasis secured following contact coagulation with tattoo injection to aid future localization.

FIGURE 333-44 Esophageal food impaction. Meat bolus impacted in the distal esophagus. therapy and are referred for endoscopy to exclude a refractory ulcer and assess for other causes. Although endoscopy is useful for excluding other diagnoses, its impact on the treatment of patients with nonulcer dyspepsia is limited. PART 10 Disorders of the Gastrointestinal System ■ ■DYSPHAGIA About 50% of patients presenting with difficulty swallowing have a mechanical obstruction; the remainder have a motility disorder, such as achalasia or diffuse esophageal spasm, or an inflammatory disorder, such as eosinophilic esophagitis. Careful history-taking often points to a presumptive diagnosis and leads to the appropriate use of diagnostic tests. Esophageal strictures (Fig. 333-53) typically cause progres sive dysphagia, first for solids, then for liquids; motility disorders often cause intermittent dysphagia for both solids and liquids. Some underlying disorders have characteristic historic features: Schatzki’s ring (Fig. 333-54) causes episodic dysphagia for solids, typically at the beginning of a meal; oropharyngeal motor disorders typically present with difficulty initiating deglutition (transfer dysphagia) and nasal reflux or coughing with swallowing; and achalasia may cause nocturnal regurgitation of undigested food from the esophagus. FIGURE 333-45 Esophageal foreign body. Intentionally ingested toothbrush impacted in the esophageal lumen.

A B C FIGURE 333-46 Gastric outlet obstruction due to pyloric stenosis. A. Nonsteroidal anti-inflammatory agent–induced ulcer disease with severe stenosis of the pylorus (arrow). B. Balloon dilation of the stenosis. C. Appearance of pyloric ring after dilation. When mechanical obstruction is suspected, endoscopy is a useful initial diagnostic test, since it permits immediate biopsy and/or dilation of strictures, masses, or rings. The presence of linear furrows and multiple corrugated rings throughout a narrowed esophagus should raise sus picion for eosinophilic esophagitis, an increasingly recognized cause of recurrent dysphagia and food impaction (Fig. 333-55). Blind or forceful passage of an endoscope may lead to perforation in a patient with stenosis of the cervical esophagus or a Zenker’s diverticulum (Fig. 333-56), but gentle passage of an endoscope under direct visual guidance is reasonably safe. Endoscopy can miss a subtle stricture or ring in some patients. When transfer dysphagia is evident or an esophageal motility disor der is suspected, esophageal radiography and/or a video-swallow study are the best initial diagnostic tests. The oropharyngeal swallowing mechanism, esophageal peristalsis, and the lower esophageal sphincter

A B C FIGURE 333-47 Sigmoid volvulus. A. Abdominal x-ray showing characteristic radiologic appearance of a “bent inner tube.” B. Site of sigmoid torsion identified at colonoscopy C. Significantly dilated colonic lumen proximal to the sigmoid twist with mild ischemic-appearing mucosal changes.

A B FIGURE 333-48 Acute colonic pseudoobstruction. A. Acute colonic dilation occurring in a patient soon after knee surgery. B. Colonoscopic placement of decompression tube with marked improvement in colonic dilation. CHAPTER 333 can all be assessed. In some disorders, subsequent esophageal manom etry is required for diagnosis. Various causes of dysphagia are amenable to endoscopic therapy. Benign strictures, rings, and webs can be dilated using a through-thescope balloon (Fig. 333-57) or a tapered polyvinyl dilator passed over a guide wire. In some instances, fibrotic strictures may respond to needle-knife electroincision (Fig. 333-58) when they prove refractory to dilation. Self-expanding esophageal stents can be used to palliate dysphagia from malignant obstruction (Fig. 333-59), and flexible endoscopic cricopharyngeal myotomy is an option for Zenker’s diver ticulum (Video V5-20). Recent advances in third-space (submucosal) endoscopy have enabled the development of procedures, such as POEM (Video V5-21) and POET (Video V5-22), for the management of achalasia and select subepithelial esophageal tumors, respectively. Gastrointestinal Endoscopy ■ ■ENDOSCOPIC TREATMENT OF OBESITY A significant proportion of Americans are overweight or obese, and obesity-associated diabetes has become a major public health prob lem. Bariatric surgery is the most effective weight-loss intervention, decreasing long-term mortality in obese persons, but many patients choose not to undergo surgery. Endoscopic treatments for obesity have been developed and include insertion of an intragastric balloon or duo denojejunal bypass liner, placement of a percutaneous gastric tube for aspiration of gastric contents after meals, duodenal mucosal electro poration, or endoscopic sleeve gastroplasty, which utilizes endoscopic suturing to narrow the lumen of the gastric body (Video V5-23). Prospective trials show that these treatments induce total-body weight loss of 7–20% and provide varying degrees of glycemic control and improvement in other diseases linked to obesity, such as metabolicassociated fatty liver disease (MAFLD). Additional endoscopic modali ties are undergoing clinical trials. The efficacy of bariatric endoscopy may approach that of bariatric surgery in the short term. Long-term outcomes are still under evaluation. ■ ■TREATMENT OF MALIGNANCIES Endoscopy plays an important role in the treatment of gastrointestinal malignancies. Early-stage malignancies limited to the mucosal and superficial submucosal layers may be resected using the techniques

PART 10 Disorders of the Gastrointestinal System A B C FIGURE 333-49 Obstructing colonic carcinoma. A. Colonic adenocarcinoma causing marked luminal narrowing of the distal transverse colon. B. Endoscopic placement of a self-expandable metal stent. C. Radiograph of expanded stent across the obstructing tumor with a residual waist (arrow). A B C FIGURE 333-50 Methods of bile duct imaging. Arrows mark bile duct stones. A. Endoscopic ultrasound (EUS) demonstrating a hyperechoic stone with acoustic shadowing (arrowhead). B. Magnetic resonance cholangiopancreatography (MRCP). C. Helical computed tomography (CT).

A C FIGURE 333-51 Causes of esophagitis. A. Severe reflux esophagitis with mucosal ulceration and friability. B. Cytomegalovirus esophagitis. C. Herpes simplex virus esophagitis with target-type shallow ulcerations. D. Candida esophagitis with white plaques adherent to the esophageal mucosa. of EMR (Video V5-5) or ESD (Video V5-6). RFA and cryotherapy are effective modalities for

ablative treatment of high-grade dysplasia and intramucosal cancer in Barrett's esophagus (Video V5-24). Gastroin testinal stromal tumors can be removed en bloc by endoscopic fullthickness resection (Video V5-4). In general, endoscopic techniques offer the advantage of a minimally invasive approach to treatment but rely on other imaging techniques (such as CT, magnetic resonance imaging [MRI], positron emission tomography [PET], and EUS) to exclude distant metastases or locally advanced disease better treated by surgery or other modalities. The decision to treat an early-stage gas trointestinal malignancy endoscopically is often made in collaboration with a surgeon and/or oncologist. A FIGURE 333-52 Early squamous cell cancer. A. Nodularity in the distal esophagus due to T1 esophageal squamous cell cancer. B. The nodular lesion remains unstained following chromoendoscopy with Lugol's solution without additional unstained areas. C. Circumferential mucosal incision around the lesion. D. Resection defect following en bloc removal of the lesion via endoscopic submucosal dissection.

B D CHAPTER 333 Endoscopic palliation of gastrointestinal malignancies relieves symptoms and, in many cases, prolongs survival. Malignant obstruc tion can be relieved by endoscopic stent placement (Figs. 333-18, 333-49, 333-59, and 333-60; Videos V5-17 and V5-18), and malignant gastrointestinal bleeding can be palliated endoscopically as well. EUSguided celiac plexus neurolysis may relieve pancreatic cancer pain. Gastrointestinal Endoscopy ■ ■ANEMIA AND OCCULT BLOOD IN THE STOOL Iron-deficiency anemia may be attributed to poor iron absorption (as in celiac sprue) or, more commonly, chronic blood loss. Intestinal bleeding should be strongly suspected in men and postmenopausal women with iron-deficiency anemia, and colonoscopy is indicated in B

C FIGURE 333-52 (Continued) such patients, even in the absence of detectable occult blood in the stool. Approximately 30% will have large colonic polyps or colorectal cancer, and a few patients will have colonic vascular lesions. When a convincing source of blood loss is not found in the colon, upper gastrointestinal endoscopy should be considered; if no lesion is found, duodenal biopsies should be obtained to exclude sprue (Fig. 333-61). Small-bowel evaluation with capsule endoscopy (Fig. 333-62), CT or magnetic resonance (MR) enterography, or deep enteroscopy may be appropriate if both EGD and colonoscopy are unrevealing. PART 10 Disorders of the Gastrointestinal System Tests for occult blood in the stool detect hemoglobin or the heme moiety and are most sensitive for colonic blood loss, although they will also detect larger amounts of upper gastrointestinal bleeding. Patients with occult blood in the stool should undergo colonoscopy to diagnose or exclude colorectal neoplasia, especially if they are >50 years old or have a family history of colonic neoplasia. Whether upper endoscopy is also indicated depends on the patient's symptoms. The small intestine may be the source of chronic intestinal bleeding, especially if colonoscopy and upper endoscopy are not diagnostic. The utility of small-bowel evaluation varies with the clinical setting and is most important in patients in whom bleeding causes A B FIGURE 333-53 Esophageal stricture. A. Peptic stricture associated with esophagitis. B. Balloon dilation of peptic stricture.

D chronic or recurrent anemia. In contrast to the low diagnostic yield of small-bowel radiography, positive findings on capsule endoscopy are seen in 50–70% of patients with suspected small intestinal bleeding. The most common finding is mucosal vascular ectasia. CT and MR enterography accurately detect small-bowel masses and Crohn's disease and are also useful for initial small-bowel evaluation. Deep enteroscopy may follow capsule endoscopy for biopsy of lesions or to

provide specific therapy, such as argon plasma coagulation of vascular ectasias (Fig. 333-63). ■ ■COLORECTAL CANCER SCREENING The majority of colon cancers develop from preexisting colonic adenomas, and colorectal cancer can be largely prevented by the detection and removal of adenomatous polyps (Video V5-25). The choice of screening strategy for an asymptomatic person depends on personal and family history. Individuals with inflammatory bowel disease, a history of colorectal polyps or cancer, family members with adenomatous polyps or cancer, or certain familial cancer syndromes (Fig. 333-64) are at increased risk for colorectal cancer. An individual without these factors is generally considered at average risk.

FIGURE 333-54 Schatzki’s ring at the gastroesophageal junction. Screening strategies are summarized in Table 333-3. While fecal immunochemical tests (FITs) for heme or stool tests for occult blood have been shown to decrease the mortality rate from colorectal cancer, they do not detect some cancers and many polyps. FIT-DNA multitar geted stool DNA tests appear to be more sensitive, but direct visualiza tion of the colon is the gold standard method for detection of polyps and cancers and remains a preferred screening strategy. Sigmoidoscopy is also used for colorectal cancer screening. However, the distribution of colon cancers has changed in the United States over time, with proportionally fewer rectal and left-sided cancers than in the past. Large American studies of colonoscopy for screening of average-risk individuals show that cancers are roughly equally distributed between the left and right colon and half of patients with right-sided lesions have no polyps in the left colon. Visualization of the entire colon thus appears to be the optimal strategy for colorectal cancer screening and prevention. Computed tomography colonography (CTC) is a radiologic tech nique that images the colon with CT following rectal insufflation of FIGURE 333-55 Eosinophilic esophagitis. Multiple circular rings of the esophagus creating a corrugated appearance and an impacted grape at the narrowed esophagogastric junction. The diagnosis requires biopsy with histologic finding of ≥15 eosinophils/high-power field.

CHAPTER 333 A Gastrointestinal Endoscopy B FIGURE 333-56 Zenker’s diverticulum. A. Contrast esophagography demonstrates a moderate-sized Zenker’s diverticulum. B. Endoscopic view of the Zenker’s diverticulum (left) relative to the true esophageal lumen (right) separated by the diverticular septum. C. Flexible endoscopic diverticulotomy using an electrosurgical knife. D. Appearance after diverticulotomy. the colonic lumen. Computer rendering of CT images generates an electronic display of a virtual “flight” along the colonic lumen, simulat ing colonoscopy (Fig. 333-65). Findings detected during CTC often require subsequent conventional colonoscopy for confirmation and treatment. ■ ■DIARRHEA Most cases of diarrhea are acute, self-limited, and due to infections or medication. Chronic diarrhea (lasting >4–6 weeks) is more often due to a primary inflammatory, malabsorptive, or motility disorder; is less likely to resolve spontaneously; and generally, requires diagnostic evaluation. Patients with chronic diarrhea or severe, unexplained acute diarrhea often undergo endoscopy if stool tests for pathogens are

C PART 10 Disorders of the Gastrointestinal System D FIGURE 333-56 (Continued) unrevealing. The choice of endoscopic testing depends on the clinical setting. Patients with colonic symptoms and findings such as bloody diarrhea, tenesmus, fever, or leukocytes in stool generally undergo sigmoidoscopy or colonoscopy to assess for colitis (Fig. 333-9). Sig moidoscopy is an appropriate initial test in most patients. Conversely, patients with symptoms and findings suggesting small-bowel disease, such as large-volume watery stools, substantial weight loss, and malab sorption of iron, calcium, or fat, may undergo upper endoscopy with duodenal aspirates for assessment of

bacterial overgrowth and biopsies for assessment of mucosal diseases, such as celiac sprue. Many patients with chronic diarrhea do not fit either of these pat terns. In the setting of a long-standing history of altered bowel habits dating to early adulthood, without findings such as blood in the stool or anemia, a diagnosis of irritable bowel syndrome may be made without direct visualization of the bowel and by relying on appropri ate blood tests (including complete blood count, C-reactive protein and antibody tests for celiac disease) to screen for other diagnoses. Steatorrhea and upper abdominal pain may prompt evaluation of the pancreas rather than the gut. Patients whose chronic diarrhea is not easily categorized often undergo initial colonoscopy to examine the entire colon and terminal ileum for inflammatory or neoplastic disease (Fig. 333-66).

A B C FIGURE 333-57 Endoscopic management of peptic stricture. A. Peptic stricture. B. Through-the-scope balloon dilation of stricture. C. Improvement in luminal diameter after dilation. ■ ■MINOR HEMATOCHEZIA Bright red blood passed with or on formed brown stool usually has an anal, rectal, or sigmoid source (Fig. 333-67). Even trivial amounts of hematochezia should be investigated with colonoscopy and/or flexible sigmoidoscopy together with anoscopy to exclude polyps or cancers, especially in patients >40 years old and those with a personal or fam ily history of colorectal polyps or cancer. Patients reporting red blood on the toilet tissue only, without blood in the toilet or on the stool, are generally bleeding from a lesion in the anal canal; careful external inspection, digital examination, and sigmoidoscopy with anoscopy may be sufficient for diagnosis in such cases. ■ ■PANCREATITIS About 20% of patients with pancreatitis have no identified cause after routine clinical investigation (including a review of medication and alcohol use; measurement of serum triglyceride, calcium, and immu noglobulin G subclass 4 [IgG4] levels; abdominal ultrasonography; and CT or MRI). Endoscopic assessment leads to a specific diagnosis

A B FIGURE 333-58 Endoscopic management of an esophagogastric anastomotic stricture. A. Recurrent anastomotic stricture despite periodic balloon dilation. B. Needle-knife electroincision of stricture. C. Improvement in luminal opening after therapy. in the majority of such patients, often altering clinical management. Endoscopic investigation is particularly appropriate if the patient has had more than one episode of pancreatitis. Microlithiasis, or the presence of microscopic crystals in bile, is a leading cause of previously unexplained acute pancreatitis and is sometimes seen during abdominal ultrasonography as layering sludge or flecks of floating, echogenic material in the gallbladder. EUS may identify microlithiasis or gallstones not seen on transabdominal ultrasound. Previously undetected chronic pancreatitis, pancreatic malignancy, or pancreas divisum may be diagnosed by either ERCP or EUS. Auto immune pancreatitis is often suspected based on CT, MRI, or serologic findings, but it may first become apparent during EUS and may require EUS-guided pancreatic biopsy for histologic diagnosis. Severe pancreatitis often results in pancreatic fluid collections. Symptomatic pseudocysts and areas of walled-off pancreatic necro sis can be drained into the stomach or duodenum endoscopically, using transpapillary and transmural endoscopic techniques. Pancreatic necrosis can be debrided by direct endoscopic necrosectomy (Video V5-2) via an endoscopically created transmural drainage site. ■ ■CANCER STAGING Local staging of esophageal, gastric, pancreatic, bile duct, and rectal cancers can be obtained with EUS (Fig. 333-20). EUS with fine-needle aspiration (Fig. 333-21) or biopsy currently provides the most accurate preoperative assessment of local tumor and nodal staging, but it does not detect many distant metastases. Details of the local tumor stage can guide treatment decisions, including resectability and need for neoadjuvant therapy. EUS with transesophageal needle biopsy may A FIGURE 333-59 Palliation of malignant dysphagia. A. Obstructing distal esophageal cancer. B. Palliative stent

placement.

C also be used to assess the presence of non-small-cell lung cancer in mediastinal nodes. OPEN-ACCESS ENDOSCOPY Direct scheduling of endoscopic procedures by providers without preceding gastroenterology consultation, or open-access endoscopy, is common. When the indications for endoscopy are clear-cut and appropriate, the procedural risks are low, and the patient understands what to expect, open-access endoscopy streamlines patient care and decreases costs. CHAPTER 333 Patients referred for open-access endoscopy should have a recent history, physical examination, and medication list that are available for review when the patient comes to the endoscopy suite. Patients with unstable or symptomatic cardiovascular or respiratory conditions should not be referred directly for open-access endoscopy. Those with particular conditions who are undergoing certain procedures should be prescribed prophylactic antibiotics before endoscopy (Table 333-1). In addition, patients taking anticoagulants and/or antiplatelet drugs may require adjustment of these agents before endoscopy based on the procedural risk for bleeding and their underlying risk for a thrombo embolic event (Table 333-2). Gastrointestinal Endoscopy Common indications for open-access EGD include dyspepsia resistant to a trial of appropriate therapy, dysphagia, gastrointestinal bleeding, and persistent anorexia or early satiety. Open-access colo noscopy is often requested in men or postmenopausal women with iron-deficiency anemia, in patients with hematochezia or occult blood in the stool, in patients with a previous history of colorectal adeno matous polyps or cancer, and for colorectal cancer screening. Flexible sigmoidoscopy is commonly performed as an open-access procedure. B

A PART 10 Disorders of the Gastrointestinal System C FIGURE 333-60 Placement of biliary and duodenal self-expanding metal stents (SEMS) for obstruction caused by pancreatic cancer. A. Endoscopic retrograde cholangiopancreatography (ERCP) demonstrates a distal bile duct stricture (arrow). B. A biliary SEMS is placed. C. Contrast injection demonstrates a duodenal stricture (arrow). D. Biliary and duodenal SEMS in place. FIGURE 333-61 Celiac sprue. Scalloped duodenal folds in a patient with celiac sprue.

B D When patients are referred for open-access colonoscopy, the pri mary care provider may need to choose a colonic preparation. Com monly used oral preparations include polyethylene glycol lavage solution, with or without citric acid. A “split-dose” regimen improves the quality of colonic preparation. Osmotic purgative preparations (such as sodium phosphate or magnesium citrate) are also effective but may cause fluid and electrolyte abnormalities and renal toxicity, especially in patients with renal failure or congestive heart failure and those >70 years of age. FIGURE 333-62 Capsule endoscopy. Images of a mildly scalloped jejunal fold (left) and an ileal tumor (right) in a patient with celiac sprue. (Images courtesy of Dr. Elizabeth Rajan; with permission.)

A C FIGURE 333-63 Small-bowel vascular ectasia. A. Actively bleeding mid-jejunal vascular ectasia identified by double-balloon enteroscopy. B. Ablation of vascular ectasia with argon plasma coagulation (APC). C. Hemostasis secured following APC. FIGURE 333-64 Familial adenomatous polyposis. Numerous colon polyps in a patient with familial adenomatous polyposis syndrome.

B CHAPTER 333 Gastrointestinal Endoscopy

TABLE 333-3 Colorectal Cancer Screening Strategies CHOICES/RECOMMENDATIONS COMMENTS Average-Risk Patients Asymptomatic individuals between 45 and 75 years of age Colonoscopy every 10 yearsa Gold standard cancer prevention strategy Multitargeted stool DNA test every 1–3 years FIT or HSgFOBT every year, with or without flexible sigmoidoscopy every 10 years CT colonography every 5 years Colonoscopy if results are positive Flexible sigmoidoscopy every 5 years Does not detect proximal colon polyps and cancers; colonoscopy if an adenomatous polyp is found Asymptomatic individuals > 75 years of age Selective screening Consider patient's overall health, results of previous screening exams, and preferences Personal History of Polyps or CRC 1–2 small (<10 mm) tubular adenomas Repeat colonoscopy in 7–10 yearsa Assuming complete polyp resection. Interval may vary based on prior personal history and family history 3–4 tubular adenomas <10 mm Repeat colonoscopy in 3–5 yearsa; subsequent colonoscopy based on findings 5–10 tubular adenomas <10 mm Repeat colonoscopy in 3 yearsa Assuming complete polyp resection

> 10 adenomas on a single exam Repeat colonoscopy in 1 yeara Consider evaluation for FAP or HNPCC; see recommendations below Adenoma ≥10 mm, or adenoma with tubulovillous or villous histology, or high-grade dysplasia Repeat colonoscopy in 3 yearsa Assuming complete polyp resection Piecemeal removal of any sessile polyp Exam in 6 months to verify complete removal Small (<1 cm) hyperplastic polyps of sigmoid and rectum Repeat colonoscopy in 10 yearsa Those with hyperplastic polyposis syndrome merit more frequent follow-up Hyperplastic polyp ≥10 mm Repeat colonoscopy in 3–5 yearsa PART 10 Disorders of the Gastrointestinal System 1–2 SSPs <10 mm Repeat colonoscopy in 5–10 yearsa Assuming complete polyp resection 3–4 SSPs <10 mm Repeat colonoscopy in 3–5 yearsa Assuming complete polyp resection 5–10 SSPs <10 mm, or any single SSP ≥10 mm, or any SSP with dysplasia Repeat colonoscopy in 3 yearsa Assuming complete polyp resection. Serrated polyposis syndrome merits more frequent follow-up Piecemeal removal of serrated polyp ≥1 cm Exam in 2–6 months to verify complete removal Colon cancer Evaluate entire colon around the time of resection, then repeat colonoscopy in 1 yeara Subsequent colonoscopy in 3 years if the 1-year examination is normal Inflammatory Bowel Disease Long-standing (>8 years) ulcerative pancolitis or Crohn's colitis, or left-sided ulcerative colitis

of >15 years' duration Colonoscopy with biopsies every 1–2 years Consider chromoendoscopy or other advanced imaging techniques for detection of flat dysplasia during colonoscopy Family History of Polyps or CRC First-degree relatives with only small tubular adenomas Same as average risk One first-degree relative with CRC or advanced adenoma at age ≥60 years Begin screening starting at age 40, tests and intervals per average-risk recommendations One first-degree relative with CRC or advanced adenoma at age <60 years, or two first-degree relatives with CRC or advanced adenomas at any age Colonoscopy every 5 years beginning at age

40 years or 10 years before the age at diagnosis of the youngest affected relative, whichever is earlier Familial adenomatous polyposis (FAP) Sigmoidoscopy or colonoscopy annually, beginning at

age 10–12 years Hereditary nonpolyposis colorectal cancer (HNPCC; Lynch syndrome) Serrated polyposis syndrome (SPS) Colonoscopy every 2 years beginning at age 20–25 years (or 10 years younger than the youngest firstdegree relative was when diagnosed with CRC) until age 40, then annually thereafter Colonoscopy at age 40 (or the same age at which the youngest first-degree relative was when diagnosed with SPS, or 10 years younger than the youngest first-degree relative was when diagnosed with CRC), then every 1–2 years thereafter Colonoscopy every 3–5 years beginning 10 years before the age at diagnosis of the youngest affected relative Family colon cancer syndrome X aAssumes good colonic preparation and complete examination to cecum. bHigh-risk adenoma: any adenoma ≥1 cm in size or containing high-grade dysplasia or villous features. Abbreviations: CRC, colorectal cancer; CT, computed tomography; FIT, fecal immunochemical test; HSgFOBT, high-sensitivity guaiac fecal occult blood test; SSP, sessile serrated polyp. Sources: Adapted from U.S. Preventative Services Task Force Draft Guidelines finalized May 18, 2021 (https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/colorectal-cancer-screening) and American Cancer Society Guidelines (https://www.cancer.org/cancer/types/colon-rectal-cancer/detection-diagnosisstaging/acs-recommendations.html), both accessed on September 15, 2023, as well as the following articles: DK Rex et al: Colorectal cancer screening: Recommendations for physicians and patients from the U.S. Multi-Society Task Force on Colorectal Cancer. Gastroenterology 153:307, 2017; S Gupta et al: Recommendations for follow-up after colonoscopy and polypectomy: A consensus update by the US Multi-Society Task Force on Colorectal Cancer. Gastroenterology 158:1131, 2020; G Mankaney et al: Serrated polyposis syndrome. Clin Gastroenterol Hepatol 18:777, 2020.

Less sensitive than colonoscopy; colonoscopy if results are positive Less sensitive than colonoscopy; colonoscopy if results are positive Assuming complete polyp resection Consider genetic counseling and testing; consider screening family members Consider histologic evaluation for microsatellite instability in tumor specimens of patients who meet modified Bethesda criteria; consider genetic counseling and testing, consider screening family members Consider screening family members, even of patients with multiple serrated polyps who do not meet SPS criteria

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