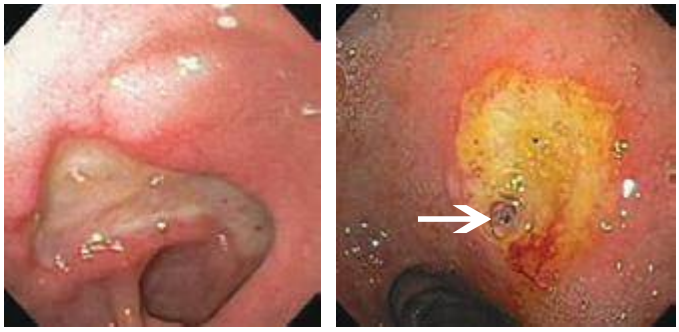


A B

FIGURE 345-1 Duodenal ulcers. *A.* Ulcer with a clean base. ***B.*** Ulcer with a visible vessel (*arrow*) in a patient with recent hemorrhage.

ENDOSCOPIC PROCEDURES

UPPER ENDOSCOPY

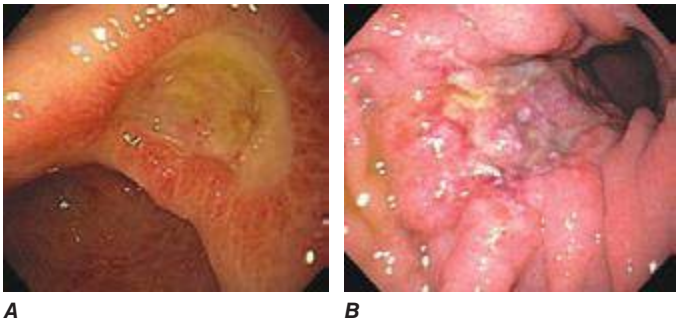
Upper endoscopy, also referred to as esophagogastroduodenoscopy (EGD), is performed by passing a flexible endoscope through the mouth into the esophagus, stomach, and duodenum. The procedure is the best method for examining the upper gastrointestinal mucosa. While the upper gastrointestinal radiographic series has similar accuracy for diagnosis of duodenal ulcer (Fig. 345-1), EGD is superior for detection of gastric ulcers (Fig. 345-2) and flat mucosal lesions such as Barrett's esophagus (Fig. 345-3), and it permits directed biopsy and endoscopic therapy. Intravenous conscious 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 routinely performed with topical pharyngeal anesthesia only. Patient tolerance 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 can often be examined. Colonoscopy is the gold standard for imaging the colonic mucosa. Colonoscopy has greater sensitivity than barium enema for colitis (Fig. 345-4), polyps (Fig. 345-5), and cancer (Fig. 345-6). Computed tomography (CT) colonography is an emerging technology that rivals the accuracy of colonoscopy for detection of some polyps and cancer, although it may not be sensitive for the detection of flat lesions, such as serrated polyps (Fig. 345-7). Conscious sedation is usually given before colonoscopy in the United States, although a willing patient and a skilled examiner can complete the procedure without sedation in many cases.

FLEXIBLE SIGMOIDOSCOPY

Flexible sigmoidoscopy is similar to colonoscopy, but visualizes only the rectum and a variable portion of the left colon, typically to 60 cm from the anal verge. This procedure causes abdominal cramping, but it is brief and is usually performed without sedation. Flexible sigmoidoscopy is primarily used for evaluation of diarrhea and rectal outlet bleeding.



A B

FIGURE 345-2 Gastric ulcers. *A.* Benign gastric ulcer. ***B.*** Malignant gastric ulcer involving greater curvature of stomach.

SMALL-BOWEL ENDOSCOPY

Three endoscopic techniques are currently used to evaluate the small intestine, most often in patients presenting with presumed small-bowel bleeding. For *capsule endoscopy*, the patient swallows a disposable capsule that contains a complementary metal oxide silicon (CMOS) chip camera. Color still images (Fig. 345-8) are transmitted wirelessly to an external receiver at several 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 and, at present, is solely a diagnostic procedure.

Push enteroscopy is performed with a long endoscope similar in design to an upper endoscope. The enteroscope is pushed down the small bowel, sometimes with the help of a stiffening overtube that extends from the mouth to the small intestine. The proximal to mid-jejunum is usually reached, and the instrument channel of the endoscope allows for biopsy or endoscopic therapy.

Deeper insertion into the small bowel can be accomplished by *single-* or *double-balloon enteroscopy* or *spiral enteroscopy* (Fig. 345-9). These instruments enable pleating of the small intestine onto an overtube (see Video 346e-1). With balloon-assisted enteroscopy, the entire intestinal tract can be visualized in some patients when both the oral and anal routes of insertion are used. Biopsies and endoscopic therapy can be performed throughout the visualized small bowel (Fig. 345-10).

ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP)

During ERCP a side-viewing endoscope is passed through the mouth to the duodenum, the ampulla of Vater is identified and cannulated with a thin plastic catheter, and radiographic contrast material is injected into the bile duct and pancreatic duct under fluoroscopic guidance (Fig. 345-11). When indicated, the sphincter of Oddi can be opened using the technique of endoscopic sphincterotomy (Fig. 345-12). Stones can be retrieved from the ducts (see Video 346e-15), biopsies can be performed, strictures can be dilated and/or stented (Fig. 345-13), and ductal leaks can be stented (Fig. 345-14). ERCP is often performed for therapy but remains important in diagnosis, especially for sphincter of Oddi dysfunction and for tissue sampling of ductal strictures.

ENDOSCOPIC ULTRASOUND (EUS)

EUS utilizes high-frequency ultrasound transducers incorporated into the tip of a flexible endoscope. Ultrasound images are obtained of the gut wall and adjacent organs, vessels, and lymph nodes. By sacrificing depth of ultrasound penetration and bringing the ultrasound transducer close to the area of interest via endoscopy, high-resolution images are obtained. EUS provides the most accurate preoperative local staging of esophageal, pancreatic, and rectal malignancies (Fig. 345-15), although it does not detect most distant metastases. EUS is also useful for diagnosis of bile duct stones, gallbladder disease, submucosal gastrointestinal lesions, and chronic pancreatitis. Fine-needle aspirates and core biopsies of masses and lymph nodes in the posterior mediastinum, abdomen, pancreas, retroperitoneum, and pelvis can be obtained under EUS guidance (Fig. 345-16). EUS-guided therapeutic procedures are increasingly performed, including drainage of abscesses, pseudocysts, and pancreatic necrosis into the gut lumen (see Video 346e-2), celiac plexus neurolysis for treatment of pancreatic pain, ethanol ablation of pancreatic neuroendocrine tumors, treatment of gastrointestinal hemorrhage, and drainage of obstructed biliary and pancreatic ducts.

NATURAL ORIFICE TRANSLUMINAL ENDOSCOPIC SURGERY (NOTES)

NOTES is an evolving 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