FIGURE 34-5 Upright plain radiograph of the abdomen. Air in dilated loops of colon and air-fluid levels can be seen in this patient with a sigmoid volvulus. (Courtesy Brian C. Jacobson, Boston, Mass.)

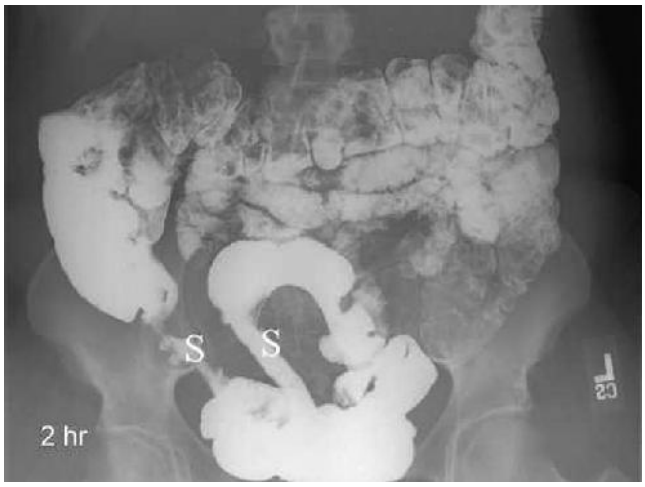

FIGURE 34-6 Small bowel follow-through. Ingested barium defines the contours of the small and large bowel lumen. A long stricture of the terminal ileum *(S)* can be seen in this patient with Crohn's disease. (Courtesy Brian C. Jacobson.)

strictures, herniations, diverticula, and abnormal peristalsis. Contrast agents can be used alone *(single contrast)* or along with instillation of air or ingestion of gas-forming agents *(double contrast)*. The former method is more useful for detecting obstructing lesions and motility disturbances, whereas the latter aids in detecting more subtle findings such as small ulcerations or polyps.

A *video esophagogram* (also known as a modified barium swallow) entails the filming of a patient's oral cavity and pharynx during the ingestion of contrast materials of various thicknesses and textures. This imaging modality permits careful assessment of a patient's ability to manipulate a food bolus, swallow effectively, and avoid aspiration events. A video esophagogram is indicated for evaluating patients with oropharyngeal dysphagia and recurrent aspiration pneumonia. A standard *barium esophagogram* (barium swallow) focuses attention on the esophagus during the ingestion of a bolus of contrast material. This study can detect esophageal rings, webs, strictures, and motility problems that endoscopy might miss. A barium esophagogram may be useful for evaluating esophageal dysphagia as well as odynophagia.

An *upper GI series* includes serial radiographic images as an ingested contrast agent travels through the esophagus, stomach, and duodenum. This study can define gastric abnormalities such as masses, ulcerations, and mucosal thickening. It is indicated in the evaluation of abdominal pain and suspected gastric outlet obstruction. If radiographic imaging continues as the contrast agent traverses the jejunum and ileum, the study is called a *small bowel follow-through* (Fig. 34-6). Indications for a small bowel follow-through include suspected small bowel obstruction or partial obstruction from any cause, suspected small bowel mucosal disease (e.g., Crohn's disease), and obscure GI blood loss. During this more involved procedure, a radiologist obtains multiple films, including *spot films*, or close-up views of regions that appear abnormal. Fluoroscopy can be used to follow a contrast agent during the journey through the small bowel. Attention is paid not only to structural findings but also to the length of time required for the contrast agent to reach and enter the colon. For more detailed small bowel images, *enteroclysis* can be performed. This method requires the infusion of concentrated contrast material directly into the small bowel through a nasojejunal tube placed under fluoroscopic guidance. Because of its invasive nature, enteroclysis is becoming less common in this era of wireless capsule endoscopy.

Single- and double-contrast barium enemas can detect colonic strictures, diverticula, polyps, and colonic ulcerations, and they can be therapeutic in reducing a sigmoid volvulus. Double-contrast barium enema may be used for colorectal cancer screening as a stand-alone test or in conjunction with flexible sigmoidoscopy, or it may be used to visualize the proximal colon when colonoscopy cannot be completed for various reasons. However, it is now infrequently used for these purposes given its relatively poor sensitivity and the availability of computed tomography colography (discussed later). In general, the upper GI series and barium enema have been superseded by upper endoscopy and colonoscopy because the endoscopic procedures offer increased sensitivity for detecting mucosal abnormalities, the ability to obtain mucosal biopsies, and the potential for resection of identified lesions.

Transabdominal Ultrasound

Ultrasonography is often the first imaging study obtained in the evaluation of suspected biliary colic, jaundice, or abnormal liver test results. Its use of sound waves to create an image obviates the need for radiation exposure, and the addition of Doppler techniques permits the assessment of vascular flow. Ultrasound can detect parenchymal abnormalities such as fatty liver or cirrhosis,