



CHAPTER

29

The Digestive System

Learning Objectives

After completing this chapter, you should be able to:

- 29.1 Define and spell the terms for this chapter.
- 29.2 List the main functions of the digestive system.
- 29.3 Identify the primary organs of the digestive system.
- 29.4 Summarize the function of each primary organ of the digestive system.
- 29.5 Identify the accessory organs of the digestive system.
- 29.6 Summarize the function of each accessory organ of the digestive system.
- 29.7 Identify common pathology associated with the digestive system.
- 29.8 Describe how the digestive system changes during the life span of a child to an older adult.

Case Study

Susan Schultz, CMA (AAMA), is working as a clinical medical assistant today with Dr. Penningworth. The doctor's next patient is a new patient, Marshall Raines. Susan immediately notices a yellowish tint to his eyeballs, and because he is wearing shorts, she can see that his legs are slightly swollen and very bruised. She also notices a faint odor of alcohol. When Susan asks Marshall what has brought him to the office, he informs her that he has recently succumbed to alcohol after being sober for three months. Also, for the past few days he "hasn't been feeling right."

Terms to Learn

• appendicitis	diverticulitis	• mastication
appendix	• diverticulosis	oral cancer
bolus	enamel	pancreas
cardiac sphincter	esophagus	pancreatic cancer
cecum	gallbladder	peptic ulcer disease (PUD)
cementum	• gastroesophageal reflux disease (GERD)	• peristalsis
• cholelithiasis	gingivae	pharynx
chyme	hemorrhoid	pyloric sphincter
• cirrhosis	hernia	pyloric stenosis
colitis	• hiatal hernia	rectum
colon	inguinal hernia	rugae
colorectal cancer	• irritable bowel syndrome (IBS)	salivary glands
• Crohn's disease	large intestine	small intestine
dentin	liver	stomach
digestive enzymes		ulcerative colitis

The main part of the digestive system is the gastrointestinal tract, which is also known as the alimentary canal. The terms *gastrointestinal tract* and *alimentary canal* are often used interchangeably, as you will find in this chapter. This tract is essentially a long, continuous tube (some 29 feet long in adults) that starts at the mouth, where food and drink enter the body, and ends at the anus, where waste products leave the body. Each of the various organs commonly associated with digestion is described in this chapter, and the organs of digestion are shown in Figure 29-1.

FUNCTIONS AND ORGANS OF THE DIGESTIVE SYSTEM

The digestive system has three main functions: digestion, absorption, and elimination. These functions help to provide the body with nourishment and energy and to maintain homeostasis. The wall of the alimentary canal (think of the rubbery wall around the hollow center of a hose) is composed of four layers—from outermost to innermost the serosa (also called the peritoneum), the muscular layer, the submucosa, and the mucosa. Table 29-1 describes these four layers of the digestive tract wall.

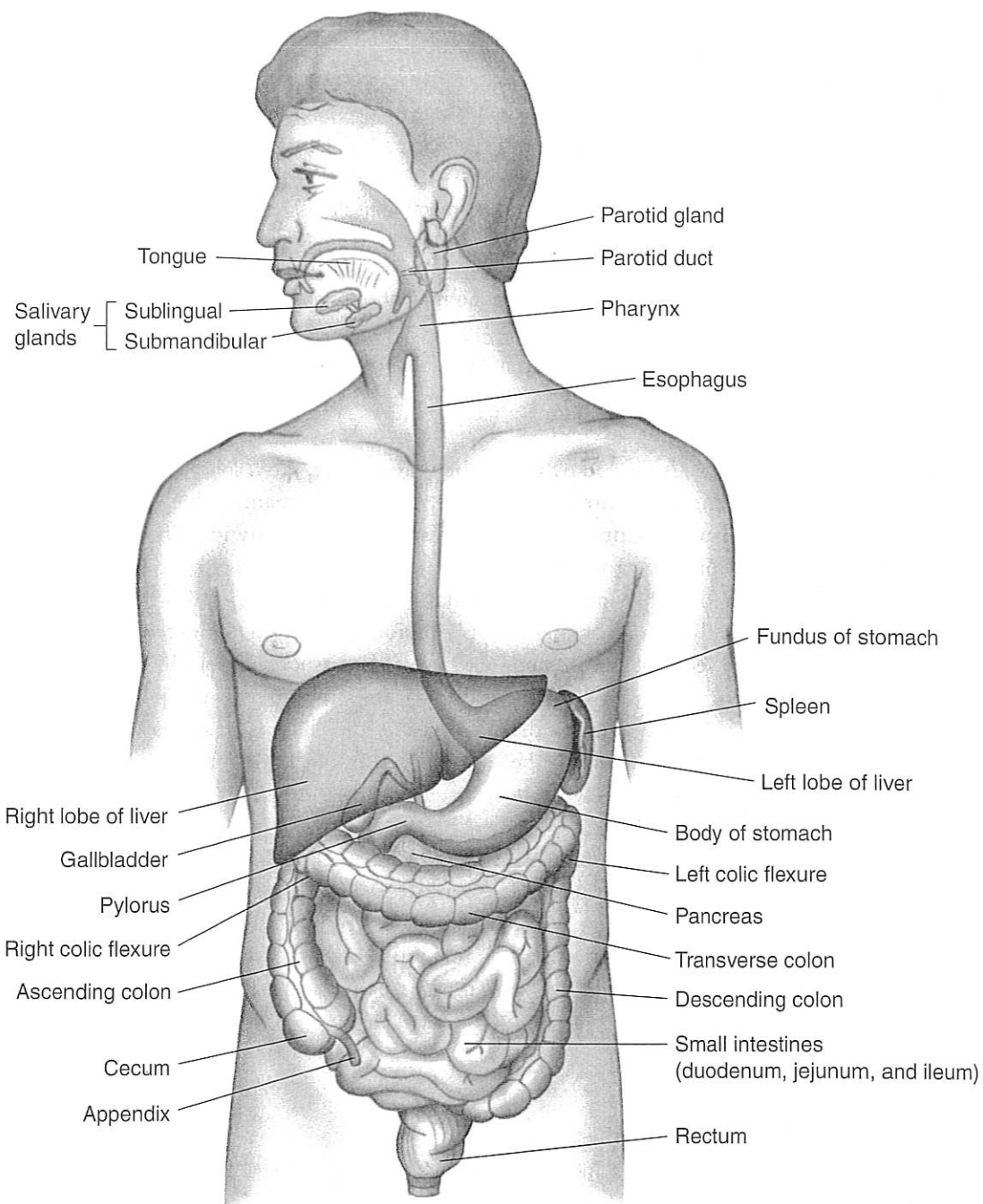


FIGURE 29-1 The digestive system.

Glands and small cells are found within the mucosal linings throughout the gastrointestinal (GI) tract. These glands and cells are important to food digestion because they produce juices known as **digestive enzymes**. The three main types of digestive enzymes are protease, which helps to digest proteins; amylase, which helps digest carbohydrates; and lipase, which helps digest fats.

Mouth

The digestive process starts a lot sooner than you may realize. The act of chewing food is termed **mastication**. Saliva produced during chewing moistens food and initiates digestion by chemically breaking down food. In the mouth, food is formed into a **bolus** (ball) for swallowing.

TABLE 29-1 | Layers of the Digestive Tract Wall

Layer	Location	Function
Serosa	Outermost layer, also known as the peritoneum	Keeps the outside part of the digestive tract moist by secreting serous fluid and prevents it from sticking to other organs.
Muscular layer	Situated between the serosa and the submucosa	Made up of smooth muscle tissue that, through contraction, is able to move items through the digestive tract.
Submucosa	The second innermost layer	Made of blood vessels, loose connective tissue, and nerves; this layer is the site of nutrient absorption.
Mucosa	The innermost layer of the digestive tract wall	Made up of epithelial tissue, which secretes digestive enzymes and assists in nutrient absorption.

The mouth, also called the oral cavity, is formed by the palate, the lips and cheeks, and the tongue (Figure 29-2). The cheeks form the lateral walls and are continuous with the lips. The hard and soft palates form the roof of the oral cavity, and the tongue is connected to the floor of the cavity by the lingual frenulum, a fold of mucous membrane. The vestibule is the space between the cheeks and the teeth.

Within the oral cavity the teeth are held in place by the **gingivae**, or gums. Three pairs of salivary glands—the parotid, sublingual, and submandibular glands—secrete saliva into the oral cavity.

A mucous membrane covers the skeletal muscle that forms the tongue. The tongue has three distinct sections; the tip, the central body, and the root (the rear portion). Elevations known as papillae cover the tongue; taste buds are found within the papillae. Four types of taste buds receive

the tastes: sweet, salty, sour, and bitter. A fifth type of taste receptor, called **umami**, which is able to decipher savory tastes, has been recently identified.

The posterior margin of the soft palate supports the muscular pharyngeal arches, which function in swallowing and phonation (formation of speech sounds), and the uvula, which is the tissue that looks like a tiny punching bag dangling from the center of the pharyngeal arches. The line formed by the pharyngeal arches and the uvula separates the oral cavity from the pharynx.

Teeth

Humans have two sets of teeth: 20 deciduous teeth (the baby teeth) and 32 permanent teeth (Figure 29-3). The deciduous teeth are smaller than the permanent teeth but generally resemble the permanent teeth, although on a much smaller scale. The set of deciduous teeth includes

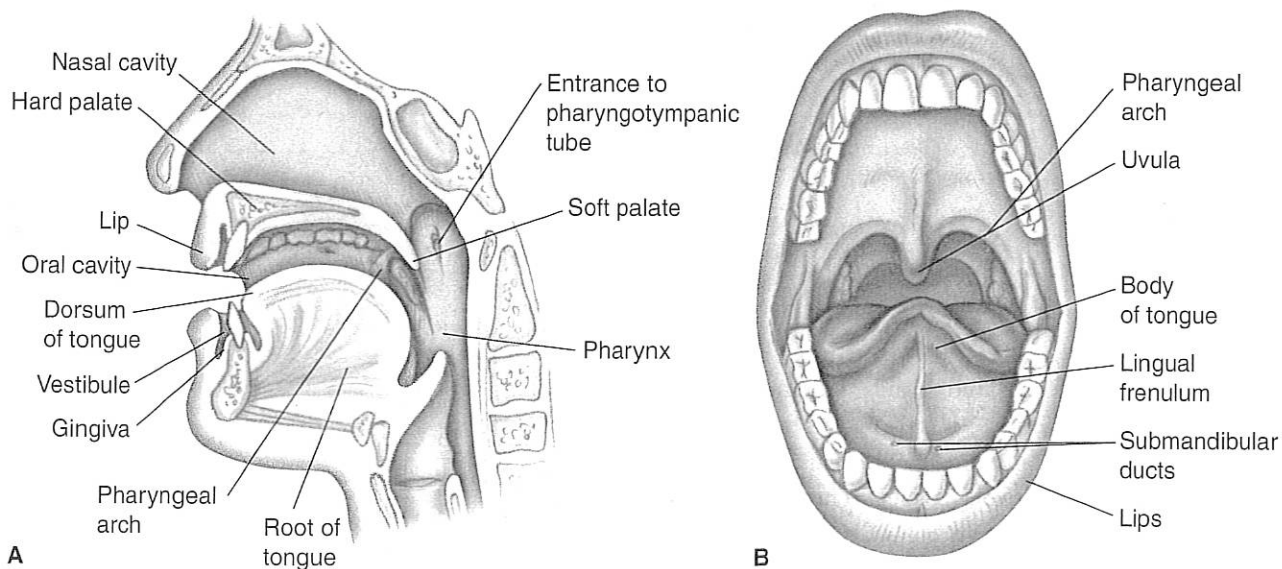


FIGURE 29-2 The oral cavity: (A) sagittal section; (B) anterior view as seen through the open mouth.

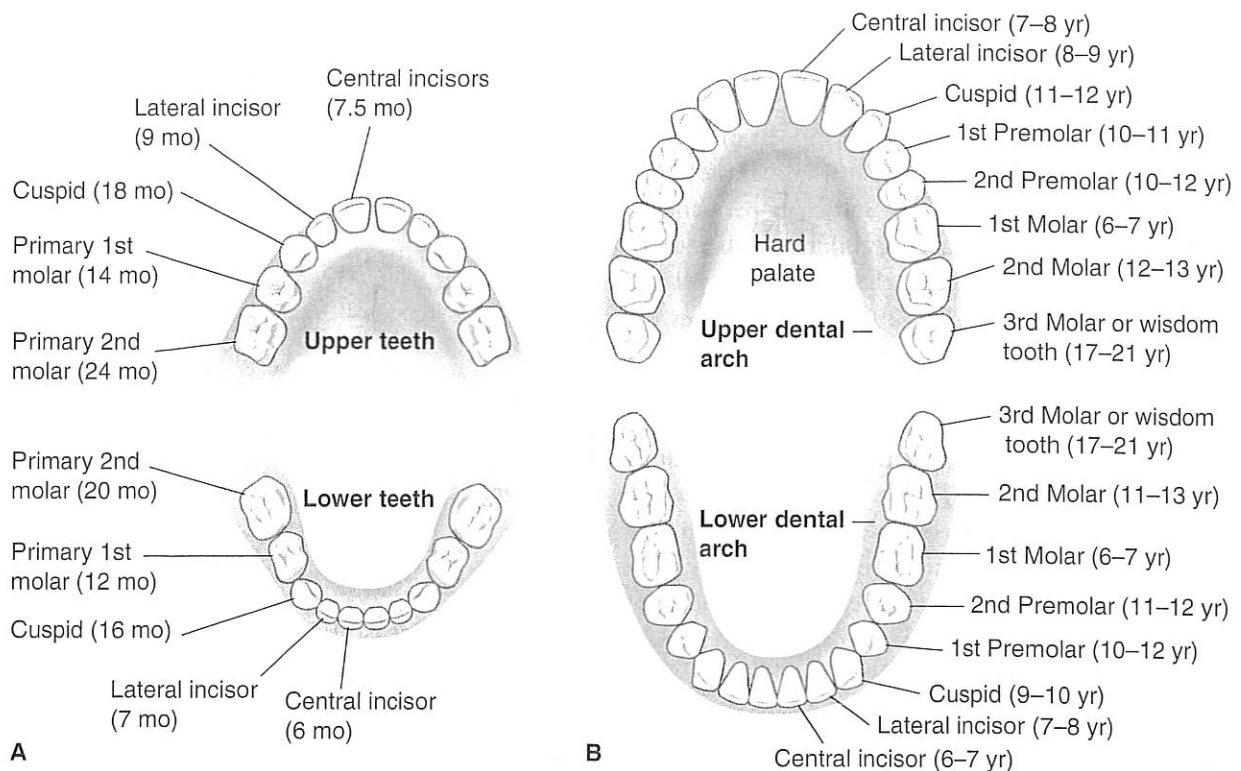


FIGURE 29-3 Deciduous and permanent teeth: (A) deciduous teeth, with the age at eruption given in months; (B) permanent teeth, with the age at eruption given in years.

8 incisors, 4 canines (cuspids), and 8 molars. The permanent teeth include 8 incisors, 4 canines, 8 premolars, and 12 molars. The teeth are contained in two dental arches, the superior arch (upper teeth) and the inferior arch (lower teeth). The permanent teeth can be differentiated as follows:

- The incisors are the four front teeth of each dental arch. They have a sharp, cutting edge, used for biting into food. The upper incisors are larger and stronger than the lower ones.
- The canine teeth, or cuspids, have roots that reach deep into the bones of the jaw. The upper canines are also known as the *eye teeth* and are larger than the lower canines. The lower canines are often called the *stomach teeth*.
- The premolar teeth are behind the canine teeth. Also known as *bicuspid teeth*, they are smaller and shorter than the canines. There are four premolars in each arch.
- The molar teeth are the largest teeth in the permanent set and are adapted to grinding and pounding food. An adult has 12 molars, 6 in each arch, posterior to the premolars.

Each tooth consists of three main parts: the crown (the part above the gum); the root (embedded in the gums);

and the neck, the portion between the root and the crown (Figure 29-4).

The solid portion of the tooth consists of the following:

- **Dentin**—Calcified, largely mineral tissue that forms the bulk of the tooth
- **Enamel**—Hardest and most compact part of the tooth; covers the exposed part of the crown

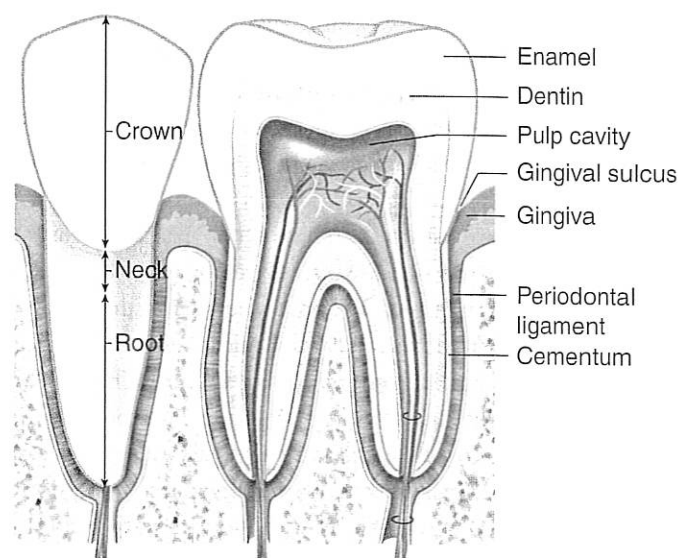


FIGURE 29-4 A diagrammatic section through a typical adult tooth.

- **Cementum**—Thin layer of bone that covers the dentin of the root, providing protection and anchoring to the periodontal ligament

The teeth are bound to the bony sockets in the maxillary (upper) and mandible (lower) jawbones by fibers of the periodontal ligament. Deciduous teeth, and then permanent teeth, erupt through the gums during childhood when they are sufficiently calcified to tolerate the stress they will be subjected to later. Review Figure 29-3 and the stages of tooth eruption.

Pharynx

The **pharynx** lies posterior to the mouth and is the beginning of the tubal component of the digestive tract that leads to the stomach. The pharynx is considered to be a part of both the respiratory and the digestive systems because both air and food pass through the pharynx. Once food is swallowed, the bolus, by reflex, passes through the pharynx into the esophagus. The muscular contractions that move the bolus of food into the esophagus also close the larynx to prevent food from entering the trachea, which leads to the bronchi and lungs.

Esophagus

The **esophagus** is a collapsible tube about 10 inches long that starts at the pharynx and ends at the stomach. Food and liquids are carried down the esophagus by the involuntary muscular contractions known as **peristalsis**. These wavelike contractions will continue to move the bolus of food through the entire digestive system.

Stomach

The **stomach** is a large, muscular, saclike organ that can hold 1 to 1.5 liters of food and fluid. Digestion, which began in the mouth, continues in the stomach (Figure 29-5). The stomach secretes hydrochloric acid and gastric juices that convert food into **chyme**, a semiliquid that is then passed into the small intestine for further digestion.

The fundus of the stomach is the upper-rounded portion of the organ. Here, undigested food is stored for up to one hour. The inside of the stomach has **rugae** (also called gastric folds) that allow the inside surface area of the stomach to expand as food is ingested. Two important structures, each a ring of muscle that allows food and liquid to enter or exit the stomach, are the cardiac and pyloric sphincters. The **cardiac sphincter** sits at the superior (upper) part of the stomach just below the esophagus. It opens and closes, allowing food and liquid to enter the stomach. Its counterpart, the **pyloric sphincter**, is situated at the inferior (lower) part near the entrance to the small intestine and facilitates passage of food and liquid out of the stomach.

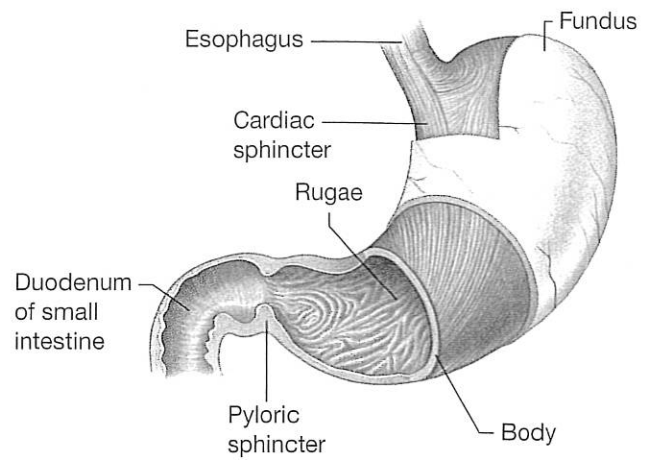


FIGURE 29-5 Stomach.

Small Intestine

The **small intestine** is 21 feet long and about 1 inch in diameter, coiled within the lower abdomen (Figure 29-6). The first 12 inches of the small intestine constitute the duodenum, the next 8 feet of the small intestine make up the jejunum, and the last 12 feet are the ileum.

Digestion continues as the chyme from the stomach enters the small intestine, where it begins to mix with bile secreted by the liver and gallbladder and pancreatic juices secreted by the pancreas.

During this time, nutrient absorption takes place. The microscopic capillaries and lymph vessels that line the walls of the small intestine absorb the nutrients and send them to

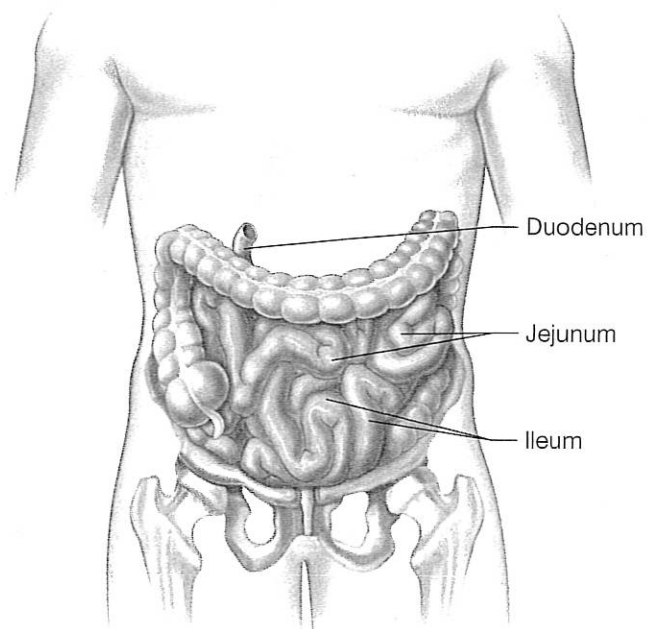


FIGURE 29-6 Small intestine.

the rest of the body's cells by way of the circulatory (cardiovascular and lymphatic) system.

Large Intestine

The small intestine ends at the ileocecal orifice of the large intestine. At that point, the ileocecal valve connects the ileum of the small intestine to the cecum of the large intestine.

The **large intestine** is about 5 feet long and 2.5 inches in diameter. The functions of the large intestine are to complete digestion and absorption.

The large intestine can be divided into several parts (Figure 29-7):

- The **cecum** is a small pouch about 3 inches long that forms the beginning of the large intestine. It receives fecal (solid) material from the small intestine.
- The **appendix** is a small appendage of the large intestine, attached to the cecum, which is not involved with digestion. In fact, its function in humans, if any, is unknown.
- The **colon** makes up the bulk of the large intestine and is divided into the ascending colon (moves upward on the right side of the abdomen), the transverse colon (moves across the body transversely from right to left), the descending colon (moves downward on the left side of the abdomen), and the sigmoid colon, which leads to the rectum.
- The waste products of digestion are eliminated from the body via the **rectum** (the final portion of the large intestine) and the **anus** (the external opening of the rectum).

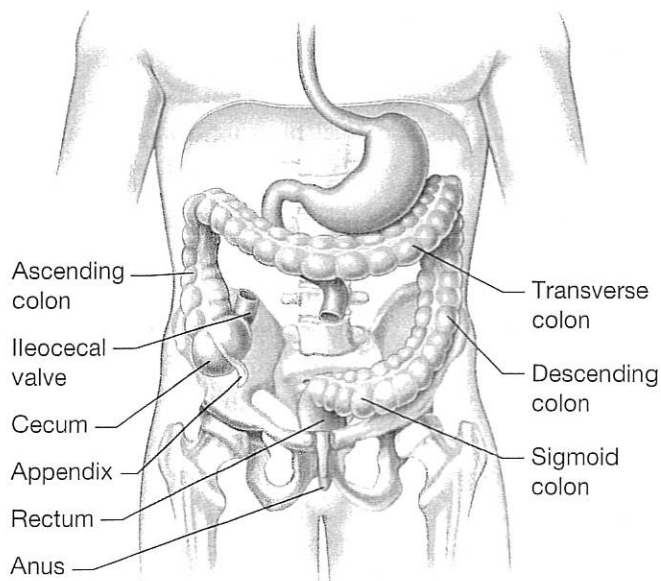


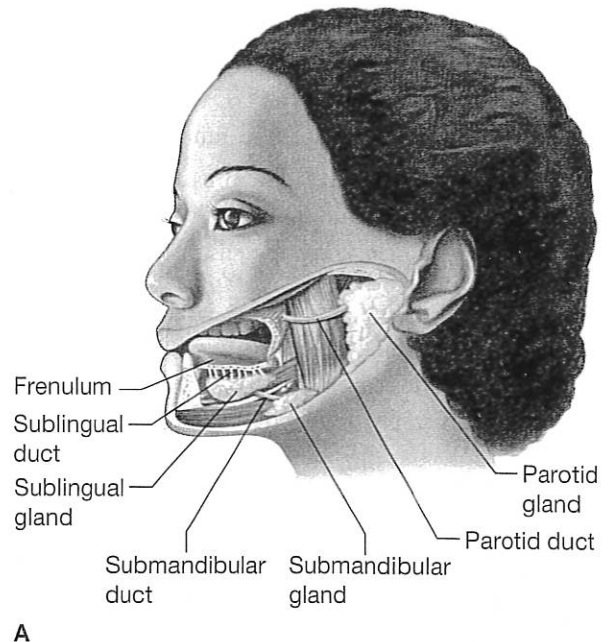
FIGURE 29-7 Large intestine.

Accessory Organs of Digestion

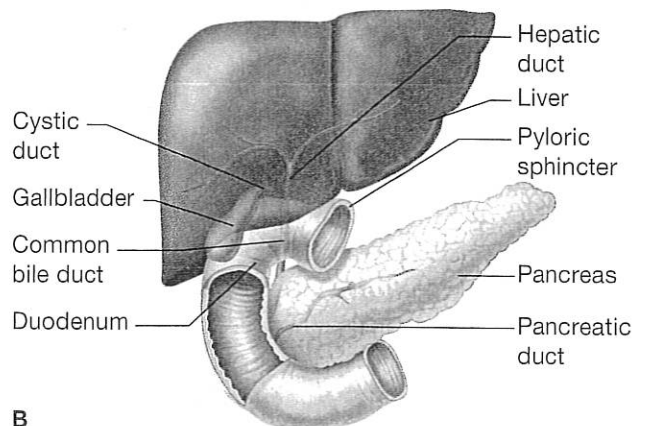
The accessory organs that are important in the role of digestion are the salivary glands, the liver, the gallbladder, and the pancreas (see Figure 29-8). They are not part of the digestive tract but perform functions closely related to it.

Salivary Glands

The **salivary glands** are located in and near the mouth. Saliva is produced by a neurological response to the sight, smell, taste, or mental image of food. There are three pairs of salivary glands. The parotid glands are located on either side of the face, just below the ear. The submandibular glands are located in the floor of the mouth. The sublingual glands are located below the tongue, forward of the submandibular glands. All these glands secrete saliva through ducts (openings) into the mouth. Saliva contains the digestive enzyme amylase, which was discussed earlier in the chapter.



A



B

FIGURE 29-8 (A) Salivary glands; (B) gallbladder, liver, and pancreas.

Liver

The **liver** is located in the upper-right quadrant of the abdomen. It is the largest glandular organ and weighs about 3.5 pounds in a healthy, average adult. The liver plays an essential role in the metabolism of carbohydrates, fats, and proteins. In carbohydrate metabolism, it changes glucose to glycogen and stores it for future use (energy the body will need) by the body's cells. To metabolize fat, the liver produces bile, which emulsifies fats (breaks them down into smaller particles to make them more digestible by digestive enzymes) before releasing the products into the bloodstream. In protein metabolism, the liver stores the components of proteins so the body can break down or build up proteins as required.

The liver produces four substances important for body functioning:

- **Bile**—Digestive juice that emulsifies fats
- **Fibrinogen and prothrombin**—Essential for blood clotting
- **Heparin**—Prevents the clotting of blood
- **Blood proteins**—Albumin, gamma globulin

The liver also stores iron and vitamins B₁₂, A, D, E, and K. It produces body heat and detoxifies substances that are potentially harmful to the body, such as drugs and alcohol.

Gallbladder

The **gallbladder** is a membranous sac in which bile is stored and concentrated. Bile stored in the gallbladder is six to ten times more concentrated than bile produced by the liver. Because of its high concentration in the gallbladder, components of bile can build up and form gallstones, possibly causing the gallbladder to become inflamed. (The presence of gallstones in the gallbladder is called **cholelithiasis**.) The removal of the gallbladder is a procedure termed cholecystectomy. Even though the gallbladder is a functioning component of the digestive system, it is not essential and its removal does not usually cause an interruption in the digestive process.

Pancreas

The **pancreas** is an elongated gland, 6 to 9 inches in length, which is situated behind the stomach and secretes pancreatic juice into the small intestine. It contains cells that produce digestive enzymes. It also has cells that secrete the hormones insulin and glucagon, which lower and raise glucose levels in the blood. Because the pancreas produces both digestive enzymes and hormones, it is considered to be a structure of both the digestive and endocrine systems.

COMMON PATHOLOGY ASSOCIATED WITH THE DIGESTIVE SYSTEM

Digestive disorders range from the nonserious, such as the occasional upset stomach, heartburn, or nausea, to the serious and life-threatening, such as colorectal cancer. These disorders involve the gastrointestinal tract as well as the liver, gallbladder, and pancreas. Most digestive disorders and diseases are complex, with subtle symptoms and often unknown causes (see Table 29-2). Some may be genetic or develop from multiple factors such as stress, fatigue, diet, smoking, and alcohol abuse. A thorough medical history and physical examination are crucial for accurate diagnosis. More extensive diagnostic evaluations may be necessary, including laboratory tests, endoscopic procedures, and imaging techniques. Table 29-3 highlights common procedures and tests related to the digestive system.

Appendicitis

Appendicitis is an inflammation of the appendix. The cause of appendicitis is linked to blockage within the appendix, which restricts blood flow and increases pressure. Blockage can occur as a result of fecal obstruction or infections of the digestive system, which cause lymph nodes near the appendix to enlarge, resulting in constriction of the appendix. Anyone can get appendicitis, but it occurs most often between the ages of 10 and 30. The appendix has no known function, and its removal does not seem to cause a change in digestive function.

Signs and Symptoms. Acute pain at the McBurney point (Figure 29-9) on the abdomen is the key symptom. This point is located on the right side of the abdomen, approximately a third of the distance between the right iliac crest (hip) and the umbilicus (navel). This pain is relieved by over-the-counter pain relievers, rest, or change of position. It is often described as sharp and severe and can lead to nausea and vomiting. Diarrhea, abdominal bloating, constipation, and low-grade fever are also possible symptoms of appendicitis.

Treatment. Because there is no effective medical therapy, appendicitis is considered a medical emergency. When a patient arrives in the emergency room and appendicitis is suspected, an appendectomy (removal of the appendix) is almost always performed as it is the only treatment option for appendicitis. Although most patients recover quickly and without problems when treated early, delay in treatment can result in the appendix becoming so inflamed that it ruptures. This leads to severe pain and serious infection and can be fatal. Diagnostic tests including bloodwork, CT scans, ultrasound, and urinalysis may be completed to confirm a diagnosis of appendicitis.

TABLE 29-2 | Disorders and Diseases of the Digestive System

Disorder/Pathology	Description
Anorexia	Loss of appetite that can accompany other conditions such as a gastrointestinal (GI) upset.
Ascites	Collection or accumulation of fluid in the peritoneal cavity.
Bulimia	Eating disorder that is characterized by recurrent binge eating followed by purging of the food with laxatives and vomiting.
Cholecystitis	Inflammation of the gallbladder.
Cholelithiasis	Formation or presence of stones, or calculi, in the gallbladder or common bile duct.
Constipation	Difficult or infrequent defecation; generally two or fewer bowel movements a week at least 25 percent of the time.
Diarrhea	Passing of frequent, watery bowel movements; usually accompanies gastrointestinal (GI) disorders.
Dyspepsia	Indigestion.
Emesis	Vomiting, usually with some force.
Enteritis	Inflammation of only the small intestine.
Esophageal Stricture	Narrowing of the esophagus that makes the flow of foods and fluids difficult.
Fissure	Crack-like split in the rectum or anal canal or roof of mouth.
Fistula	Abnormal tubelike passage from one body cavity to another, or between an organ and the exterior of the body.
Gastritis	Inflammation of the stomach, which can result in pain, tenderness, nausea, and vomiting.
Gastroenteritis	Inflammation of the stomach and small intestine.
Halitosis	Bad or offensive breath, which is often a sign of disease.
Hepatitis	Inflammation of the liver.
Ileitis	Inflammation of the ileum of the small intestine.
Inflammatory Bowel Disease	Ulceration, of unknown origin, of the mucous membranes of the colon; also known as ulcerative colitis.
Intussusception	Result of the intestine slipping or telescoping into another section of intestine just below it; more common in children.
Malabsorption Syndrome	Inadequate absorption of nutrients from the intestinal tract; may be caused by a variety of diseases and disorders, such as infections and pancreatic deficiency.
Peptic Ulcer	Ulcer occurring in the lower portion of the esophagus, stomach, or duodenum thought to be caused by the acid of gastric juices; some now successfully treated with antibiotics.
Pilonidal Cyst	Cyst in the sacrococcygeal region caused by tissue being trapped below the skin.
Polyphagia	Eating excessively.
Polyps	Small tumors that contain a pedicle, or foot-like attachment, in the mucous membranes of the large intestine (colon).
Reflux Esophagitis	Acid from the stomach backing up into the esophagus, causing inflammation and pain.
Regurgitation	Return of fluids and solids from the stomach into the mouth; similar to emesis but without the force.
Volvulus	Condition in which the bowel twists on itself and causes an obstruction; painful and requires immediate surgery.

TABLE 29-3 | Procedures and Diagnostic Tests Related to the Digestive System

Procedure/Test	Description
Abdominal Ultrasonography	Ultrasound equipment produces sound waves used to create an image of the abdominal organs.
Air-contrast Barium Enema	Using both barium and air to visualize the colon on X-ray.
Anastomosis	Creating a passageway or opening between two organs or vessels.
Appendectomy	Surgical removal of the appendix.
Barium Enema (Lower GI)	Radiographic examination of the small intestine, large intestine, or colon, in which an enema containing barium is administered to the patient while X-ray pictures are taken.
Barium Swallow (Upper GI)	Barium mixture swallowed while X-ray pictures are taken of the esophagus, stomach, and duodenum. It is used to visualize the upper GI tract. Also called esophagram.
Cholecystectomy	Surgical excision of the gallbladder. Removal of the gallbladder through the laparoscope is most commonly performed, because it has fewer complications than the more invasive abdominal surgery. The laparoscope requires small incisions that are made in the abdominal cavity.
Cholecystogram	Radiopaque contrast given, via the oral route, to the patient that is absorbed and enters the gallbladder. An X-ray is then taken showing the dye contrast.
Choledocholithotomy	Removal of a gallstone through an incision into the bile duct.
Choledocholithotripsy	Crushing of a gallstone in the common bile duct. Commonly called lithotripsy.
Colectomy	Surgical removal of the entire colon.
Colonoscopy	Flexible fiberscope passed through the anus, rectum, and colon is used to examine the upper portion of the colon. Polyps and small growths can be removed during the procedure.
Colostomy	Surgical creation of an opening in a portion of the colon through the abdominal wall to the outside surface.
Diverticulectomy	Surgical removal of a diverticulum.
Endoscopic Retrograde Cholangiopancreatography (ERCP)	Use of an endoscope to X-ray the bile and pancreatic ducts.
Esophagogastrostomy	Surgical connection (anastomosis) of the esophagus and stomach.
Esophagoscopy	The esophagus is visualized by passing a flexible tube down the esophagus. A tissue sample for biopsy may be obtained.
Esophagostomy	Surgical creation of an opening into the esophagus.
Esophagram	As barium is swallowed, the solution is observed (via X-ray) traveling from the mouth into the stomach. Also called a barium swallow.
Exploratory Laparotomy	Abdominal operation for the purpose of examining the abdominal organs and tissues for signs of disease or other abnormalities.
Fistulectomy	Excision of a fistula.
Gastrectomy	Surgical removal of part or all of the stomach.
Gastric Lavage	A sample of gastric contents is obtained by insertion of an orogastric tube through the mouth and into the stomach.
Gastrointestinal Endoscopy	A flexible instrument or scope is passed either through the mouth or anus to facilitate visualization of the GI tract.
Glossectomy	Complete or partial removal of the tongue.
Hemorrhoidectomy	Surgical excision of hemorrhoids from the anorectal area.
Hepatic Lobectomy	Surgical excision of a lobe of the liver.
Ileostomy	Surgical creation of a passageway through the abdominal wall into the ileum. The fecal matter (stool) drains into a bag worn on the abdomen.

TABLE 29-3 | Procedures and Diagnostic Tests Related to the Digestive System (*continued*)

Procedure/Test	Description
Intravenous Cholangiogram	A dye administered to the patient allows for visualization of the bile vessels.
Intravenous Cholecystograph	A dye administered intravenously to the patient allows for visualization of the gallbladder.
Jejunostomy	Surgical creation of a permanent opening into the jejunum.
Lithotripsy	Crushing of a stone located within the gallbladder.
Liver Biopsy	Excision of a small piece of liver tissue for microscopic examination. This is generally used to determine if cancer is present.
Liver Scan	A radioactive substance is administered intravenously to the patient. This substance enters liver cells, and the organ can then be visualized to detect tumors, abscesses, and other liver conditions.
Occult Blood	Test performed on feces to determine the presence of invisible amounts of blood. Positive results may indicate gastrointestinal bleeding.
Ova and Parasites	Test performed on stool to identify ova and parasites. A positive result indicates protozoa infestation.
Proctoplasty	Plastic surgery of the anus and rectum.
Splenectomy	Surgical removal of the spleen.
Stool Culture	Test performed on stool to identify the presence of microorganisms.
Ultrasonography, Gallbladder	Test to visualize the gallbladder by using high-frequency sound waves. It is often used to detect gallbladder inflammation, biliary obstructions, or gallstones.
Ultrasonography, Liver	Test to visualize the liver by using high-frequency sound waves. It is used to detect hepatic tumors, cysts, abscesses, and cirrhosis.
Upper Gastrointestinal Fiberscopy	Direct visualization of the gastric mucosa via flexible fiberscope. Used to detect gastric neoplasm.
Vagotomy	Surgical resection of the vagus nerve in an attempt to decrease the amount of acid secretion into the stomach. This may be used as a treatment for ulcer patients.

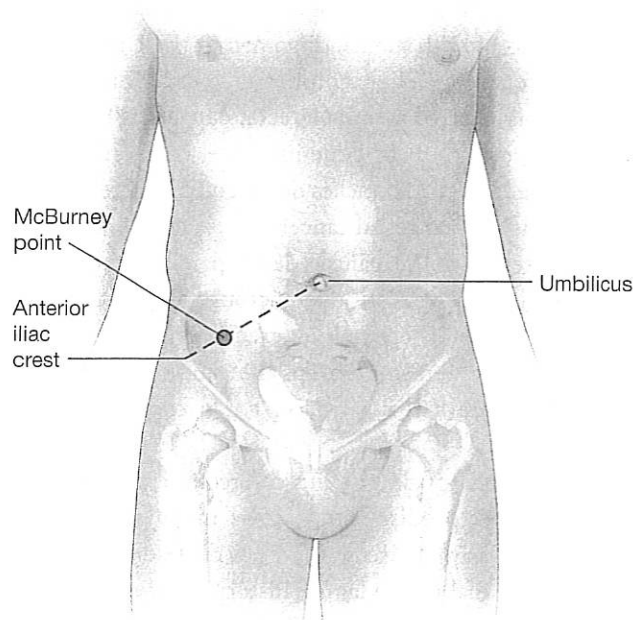


FIGURE 29-9 McBurney point.

Cirrhosis

Cirrhosis is a disease marked by scarring of the tissues of the liver. The scarring is damaging and, in fact, can be life-threatening. When the liver has been in a state of inflammation for an extended period of time (often years), scarring begins to replace healthy liver tissue. This prevents the liver from functioning at its normal capacity.

Multiple factors lead to the inflammation and scarring associated with cirrhosis. In the United States, the major causes of cirrhosis are years of excessive alcohol consumption and certain forms of viral hepatitis (mainly hepatitis B or C). Nonalcoholic fatty liver disease (NAFLD) is a type of cirrhosis caused by excessive amounts of fat stored in the liver. This form of cirrhosis is common in obese patients. Inflammation and blockage of the ducts that transport bile out of the liver is also a cause of cirrhosis that may be related to a problem with the immune system. Autoimmune hepatitis results when the immune system attacks the liver. Sometimes cirrhosis can be caused by an inherited disease, such as cystic fibrosis.



The Child

- Infants may suffer from digestive system disorders including GERD and pyloric stenosis. It is also common for infants and toddlers to have bouts of vomiting and diarrhea. Because of their smaller size, dehydration is more likely to occur during times of illness. Infants, toddlers, and children should be closely monitored and encouraged to increase fluid intake as a precaution. Pedialyte and other electrolyte replacement drinks may be beneficial to prevent dehydration.
- Teeth eruption occurs during infancy, often causing irritability, painful gums, and ear pain.
- Proper nutrition and a healthy diet should be implemented as soon as an infant begins to eat solid foods. This will promote proper growth and enable the digestive system, as well as other bodily systems, to function optimally.

The Older Adult

- Peristalsis becomes weaker and is less effective as the digestive system ages. This causes the movement of food and waste throughout the digestive tract to slow.
- Aging of the teeth and gums, resulting from continual use throughout life, causes tooth surfaces to weaken and wear down. Gums also begin to recede. Periodontal disease is more common among older adults, and some require complete tooth extraction and replacement dentures. Approximately 25 percent of adults aged 60 and older wear full dentures.
- Changes in taste and food preferences are also common as an individual ages. This, along with slowed gastric motor activity, can lead to loss of appetite and decreased fluid intake, which often results in constipation.
- Increased age is also a risk factor for various digestive system diseases and disorders such as cancers, hernias, diverticulosis, and diverticulitis.

Signs and Symptoms. In many cases, signs and symptoms develop only after the disease has progressed. They include fluid buildup in the legs (edema) and abdomen (ascites), fatigue, yellowing of the skin (jaundice), itching, nosebleeds, redness of the palms, easy bruising, weight loss and muscle loss, abdominal pain, frequent infections, and confusion.

Treatment. The patient with cirrhosis must avoid substances that can further damage the liver, especially alcohol and nonsteroidal antiinflammatory drugs. Treatment may also include dietary changes, including a low-fat and low-sodium diet to promote weight loss. Treatment of any underlying

conditions (such as hepatitis or alcoholism) is necessary to prevent the progression of the disease. A liver transplant may be considered when liver damage is severe.

Colitis

Colitis is an inflammation of the large intestine. Many disease processes may cause colitis, including acute and chronic infections, primary inflammatory disorders (ulcerative colitis or Crohn's disease), impaired blood flow (ischemic colitis), and history of radiation exposure to the large bowel.

Signs and Symptoms. Signs and symptoms can include abdominal pain, diarrhea, dehydration, fever and chills, abdominal bloating, increased intestinal gas, and bloody stools. Another common symptom is the constant urge to have a bowel movement, a condition known as tenesmus. The disorder may be identified by flexible sigmoidoscopy or colonoscopy. In both tests, a flexible tube is inserted into the rectum and used to evaluate specific areas of the colon. Biopsies taken during these tests may show changes related to inflammation. Other studies, such as barium enema, abdominal CT scan, abdominal MRI, and abdominal X-ray, may be used to identify colitis.

Treatment. Treatment of colitis is directed at treating the underlying cause—infection, inflammation, lack of blood flow, or another cause. When the underlying cause is identified and treated, the symptoms of colitis should begin to lessen and resolve.

Colorectal Cancer

Colorectal cancer is the second-leading cause of cancer-related deaths of both men and women in the United States after lung cancer. When colon and rectal cancer occur together, it is referred to as **colorectal cancer**. When cancer attacks any portion of the large intestine, it is termed colon cancer. If the last 8 to 10 inches of the colon (the rectum) are diseased, it is termed rectal cancer.

Most cases of colon cancer develop when the cells of benign polyps (often called adenomatous polyps) mutate and become cancerous. There isn't an exact known cause related to how or why a person develops the cancerous mutations, though there are a few forms of colon cancer that have genetic ties.

The likelihood of developing colorectal cancer increases with age. Other predisposing factors include a history of inflammatory bowel disease (Crohn's disease or ulcerative colitis), type 2 diabetes, a family history of colorectal cancer, and race and ethnicity, particularly African American or Ashkenazi (Jews of Central or Eastern European descent).

Professionalism



It is very important that patients and their families understand instructions and explanations that are pertinent to their medical care. Sometimes, ensuring this can present difficulties. If you are working in an office in which English is the primary language and your first language is not English, or if you have a heavy regional accent not native to your office, practice speaking very clearly so that patients can understand your instructions. Supplement verbal instructions with clearly written instructions to help increase understanding. Be sure explanations do not include medical terminology but rather lay terms everyone can understand. At the same time, do not oversimplify so that the patients feel “talked down to.”

Signs and Symptoms. Because the polyps are small and produce few if any symptoms, regular screening tests are important to help prevent undetected progression to end-stage cancer. If signs and symptoms of cancer do appear, they may include a change in bowel habits, rectal bleeding, bloody stools, long and thin stool, persistent abdominal cramping, gas, abdominal pain, appetite loss and weight loss, and excessive fatigue. Screening tests and dietary changes such as increasing fiber-rich foods and limiting the amount of red meat and processed meats consumed can reduce the risk of developing colon cancer. Lifestyle changes such as increasing physical activity, reducing alcohol consumption, and smoking cessation can also dramatically reduce a person's overall risk of developing colon cancer.

Treatment. The three primary treatment options are surgery, chemotherapy, and radiation. The physician will decide on a treatment based on the stage, size, and location of the cancerous tumor. Surgery is the main treatment for colorectal cancer. The amount of the colon that is removed is determined by the extent to which the cancer has penetrated the wall of the colon and whether it has spread to the lymph nodes or other parts of the body. This information will also determine if chemotherapy or radiation treatments should also be considered. If part of the colon is removed, sometimes the remaining colon is brought to the surface of the abdomen so stool comes out of a colostomy (a stoma, or opening created in the abdominal wall) into an attached receptacle instead of through the rectum. Preventative measures to detect early stages of colon cancer include routine colonoscopy screenings for both men and women after the age of 50.

Crohn's Disease and Ulcerative Colitis

Crohn's disease is a chronic inflammatory disease of the intestines. Usually it causes painful inflammation and ulcerations in both the small and large intestines. However, ulcerations can occur anywhere along the digestive tract from mouth to anus. **Ulcerative colitis** is closely linked to Crohn's disease; however, it affects only the colon. These two conditions, when linked together, are known as inflammatory bowel disease. About 1.4 million Americans suffer from these conditions.

Crohn's disease is not contagious, and the exact cause is unknown. Crohn's disease may have a genetic component, because it tends to be more common in patients within the same family. Crohn's disease also may be caused by environmental factors. Overall, it is classified as an autoimmune disorder because the body attacks the normal and healthy cells of the gastrointestinal tract.

Signs and Symptoms. Common symptoms and signs of Crohn's disease include abdominal pain, urgency and pain with defecation, rectal bleeding, bloody or watery diarrhea, decreased appetite, and weight loss. Patients with Crohn's disease typically experience periods of relapse (worsening of inflammation) followed by periods of remission (reduced inflammation) lasting months to years.

Treatment. There is no cure for Crohn's disease. The goals of treatment are to induce remission, maintain remission, minimize side effects of treatment, and improve quality of life. A large focus is placed on eating a healthy and balanced diet and drinking plenty of fluids as well as limiting dairy products and avoiding high-fiber and high-fat foods, which impact bowel movements. Patients with mild symptoms or whose disease is in remission (symptoms are absent) may not need treatment. Treatment of both Crohn's disease and ulcerative colitis with medications is similar, although not always identical. These medications may include antiinflammatory agents, corticosteroids, antibiotics, and immunomodulators, which are used to weaken the immune system to reduce the severity of autoimmune response. Severe Crohn's disease may lead to a colostomy, either permanently or temporarily. A temporary colostomy bag may be used to allow the colon to rest and heal during times of severe inflammation when recuperation is anticipated.

Diverticulosis and Diverticulitis

Diverticulosis is the condition of having diverticula, small pouches or sacs in the wall of the colon (Figure 29-10). The sigmoid colon is typically where diverticulosis appears. This S-shaped portion of the colon lies in the lower left portion of the abdomen. Diverticulosis is more likely to occur when

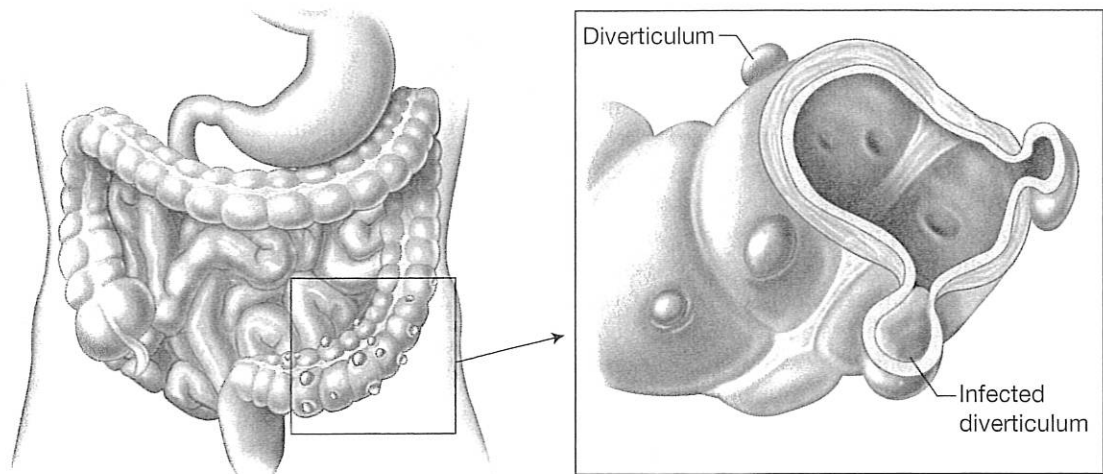


FIGURE 29-10 Colon with diverticulosis. An inflamed or infected diverticulum is called diverticulitis.

the walls of the colon weaken, which naturally happens as a person ages. Constipation as well as the action of trying to push and expel hardened and dry stool causes elevated pressure within the walls of the colon, also resulting in the formation of diverticula.

Diverticulitis is an inflammation or infection of the diverticula. The exact cause of diverticulitis is not known, but the inflammation generally begins when stool becomes stuck within a diverticulum and bacteria form. Infection can lead to complications such as swelling or rupture.

Signs and Symptoms. Most patients with diverticulosis have few or no symptoms; mild symptoms include abdominal cramping and bloating. Signs and symptoms of diverticulitis include pain, fever, chills, cramping, bloating, decreased appetite, constipation, and diarrhea. It is not uncommon for these symptoms to appear suddenly.

Treatment. Preventing the formation of diverticula in the colon is optimal. This can be helped by eating a high-fiber diet, which can help maintain regular bowel habits. Treatment of diverticulitis depends on the severity of the condition and the symptoms. Minor symptoms may be treated with rest and increased fluid intake; the application of heat (as with a heating pad) can also be of comfort. Antibiotics may also be prescribed to treat infection. In serious cases, hospitalization and surgery may be necessary.

Gastroesophageal Reflux Disease

Gastroesophageal reflux disease (GERD) occurs when the cardiac sphincter, sometimes referred to as the lower esophageal sphincter, does not close completely or tightly or when it relaxes. Without proper closure of the sphincter stomach contents, including gastric fluids, move back up into the

esophagus, an action is called reflux. The acidic fluids found in the stomach are very harsh and can be damaging when refluxed into the esophagus, causing inflammation and a condition known as reflux esophagitis.

When not treated, GERD can lead to a variety of other serious conditions, including:

- Barrett's esophagitis, which is known to be a precancerous condition
- Perforation (tearing) of the esophagus
- Esophageal stricture (abnormal narrowing of the esophagus)
- Esophageal ulcers
- Esophageal cancer

Risk factors for developing GERD include obesity, hiatal hernia (protrusion of part of the stomach into the thorax through a tear in the diaphragm), pregnancy, and smoking. GERD can also be triggered or made worse by many types of prescription medications and over-the-counter pain medications.

Signs and Symptoms. Symptoms include heartburn that is worse when lying down, bending over, and during the night; sore throat; a hoarse voice; a bad taste in the mouth; a sensation of food being stuck behind the breast bone; belching; and regurgitation of food. Some patients with mild cases of GERD are symptom free.

Treatment. Treatment of GERD relies on medications that block the production of hydrochloric acid (the chief digestive acid) and protect the mucosa of the esophagus. Patients may incorporate simple measures such as avoiding foods that cause symptoms, not lying down until at least three hours after eating, losing weight, and sleeping on a bed with the

Professionalism The Law



Some digestive disorders, such as stomach ulcers, irritable bowel syndrome (IBS), and gastroesophageal reflux disease (GERD), may be associated with a person's lifestyle. As a member of the health care profession, your role is to provide care and to assist with the treatment of your patients. It is never acceptable, nor appropriate, to judge or make reference to how a person chooses to live, even if an individual's lifestyle choices are counterproductive to that person's health. However, when required, you are expected to provide patients with physician-approved information and education regarding how they can best manage their conditions and, at the same time, live a long and productive life.

head elevated 6 inches. Over-the-counter antacids may also provide comfort, although only temporarily. If medications and basic treatments do not work, fundoplication, a surgical procedure that tightens the cardiac sphincter and its surrounding tissues, can be performed. Strictures that may result from GERD are treated with dilation, or expansion, of the narrowed area.

Hemorrhoids

A **hemorrhoid** is a dilated, or enlarged, vein in the walls of the anus and sometimes the rectum. Hemorrhoids are sometimes called piles. They are caused by increased pressure in the anus usually because of untreated constipation, but occasionally it is associated with chronic diarrhea. Hemorrhoids are also common after a woman gives birth because of the increased pressure associated with pushing the baby out of the birth canal.

Signs and Symptoms. The major sign is bleeding after defecation, particularly bright red blood on toilet tissue or in the toilet bowl. Itching and pain in the anal region are also common and can be worse with prolonged periods of sitting. If untreated, hemorrhoids can worsen and protrude from the anus. Fissures (cracks or tears in the wall of the rectum) may develop and cause intense discomfort.

Treatment. Treatment is aimed at changing the diet to prevent constipation and avoid further irritation. A patient who is constipated should be instructed to increase fluid intake; increase fiber in the diet; avoid problematic foods such as milk, cheese, and other dairy products; and increase the level of exercise, including walking. The patient should be instructed not to ignore the urge to defecate but to respond in a timely manner, as well as to establish and maintain a daily

routine for defecation. Stool softeners may be used to decrease episodes of constipation. Topical hemorrhoid creams help relieve discomfort from itching and irritation, and corticosteroid creams help reduce swelling and inflammation. Hemorrhoid removal (hemorrhoidectomy) is performed when the patient is in extreme discomfort or has excessive bleeding.

Hernia

A **hernia** is the abnormal protrusion of an organ or part of an organ through a weakness in the wall of the body cavity that contains it. The most common types of abdominal hernias are hiatal hernias and inguinal hernias.

Hiatal Hernia

A **hiatal hernia** develops when a part of the stomach (the upper portion) pushes upward and enters the chest cavity through a weakened esophageal hiatus (an opening in the diaphragm) (Figure 29-11).

The actual hernia is caused, as just mentioned, by a weakened esophageal hiatus, but there are risk factors associated with developing this condition. These include obesity, slouching (poor posture when seated), frequent coughing, straining with constipation, frequent bending over or heavy lifting, heredity, smoking, and congenital defects.

Signs and Symptoms. Some patients with hiatal hernia are asymptomatic. For others, symptoms and signs include belching and hiccups, chest pain or pressure, difficulty swallowing, and coughing. It is common to have both a hiatal hernia and GERD (discussed previously). The reason why hiatal hernia and GERD often occur together is thought to be that the hernia contributes to the weakening of the cardiac sphincter muscle, which in turn allows the reflux of stomach contents into the esophagus. When patients have both of these conditions, heartburn is a very common symptom.

Treatment. Medications used to treat acid reflux are helpful in reducing symptoms caused by excessive gastric acid. Activity changes to reduce symptoms that are suggested include refraining from lifting heavy objects, improving posture, increasing exercise, losing excess weight, and trying to incorporate activity after a meal rather than reclining or lying down. It is also helpful to incorporate dietary restrictions including avoiding chocolate, caffeine, alcohol, and fatty foods. The only cure for a hernia is surgical repair.

Inguinal Hernia

An **inguinal hernia** occurs at a weakened spot on the abdominal wall or groin that allows a portion of the intestine or tissue to push through, causing a round lump, or

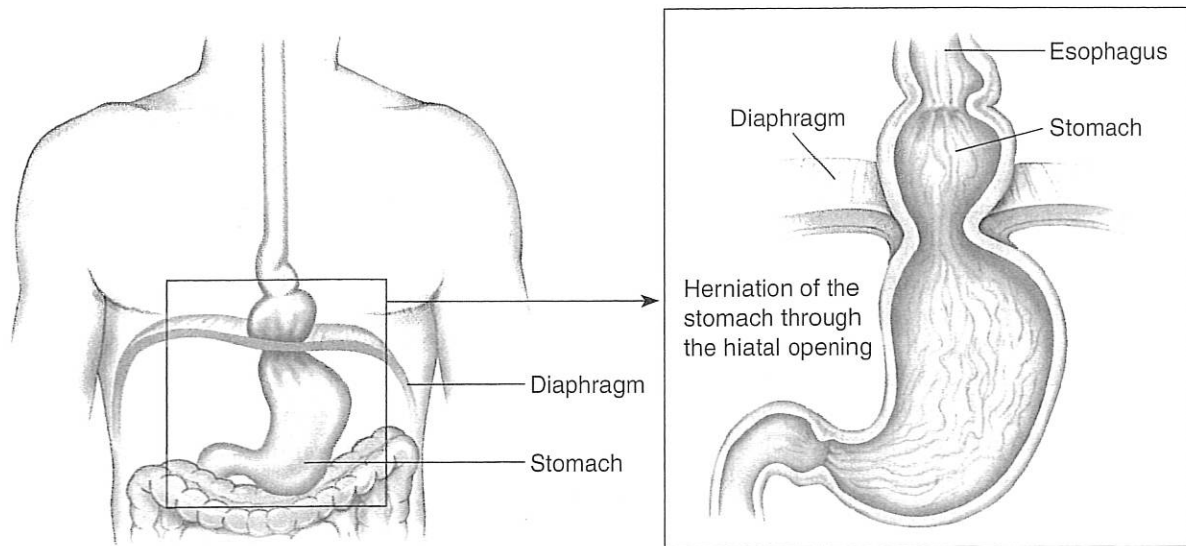


FIGURE 29-11 Hiatal hernia.

bulge, in the scrotum or groin (Figure 29-12). The hernia can be the result of a weakened muscular wall that stems from improper closing of muscular wall openings before birth. In this circumstance, developing a hernia may happen soon after birth of the infant or not until much later in life. An inguinal hernia may also develop suddenly as a result of strenuous activity such as heavy lifting, bending, straining, and even laughing. A common characteristic of inguinal hernias is that the bulge flattens when the patient lies down.

An incarcerated hernia is one that is so blocked or enlarged that it is trapped in the opening it came through and cannot be returned through the opening by manipulation. An incarcerated hernia can worsen to the point of strangulation. A strangulated hernia is one that is so constricted that the

blood supply to the intestine is cut off. This is a potentially life-threatening condition.

Signs and Symptoms. Pain and discomfort in the affected area are common and often worsen when the person bends or lifts an object. Other signs and symptoms of an inguinal hernia include tugging or burning sensations and a feeling of heaviness in the area of the hernia, scrotum, or inner thigh. Swelling is also common for both men (in the scrotum) and women (in the labia). Nausea and vomiting, often sudden in onset, may also be present if part of the intestine bulges outside the abdomen and becomes incarcerated.

Treatment. Surgery is the only treatment and cure for inguinal hernia and may be required if the hernia is incarcerated or strangulated. Hernia repair is one of the most common

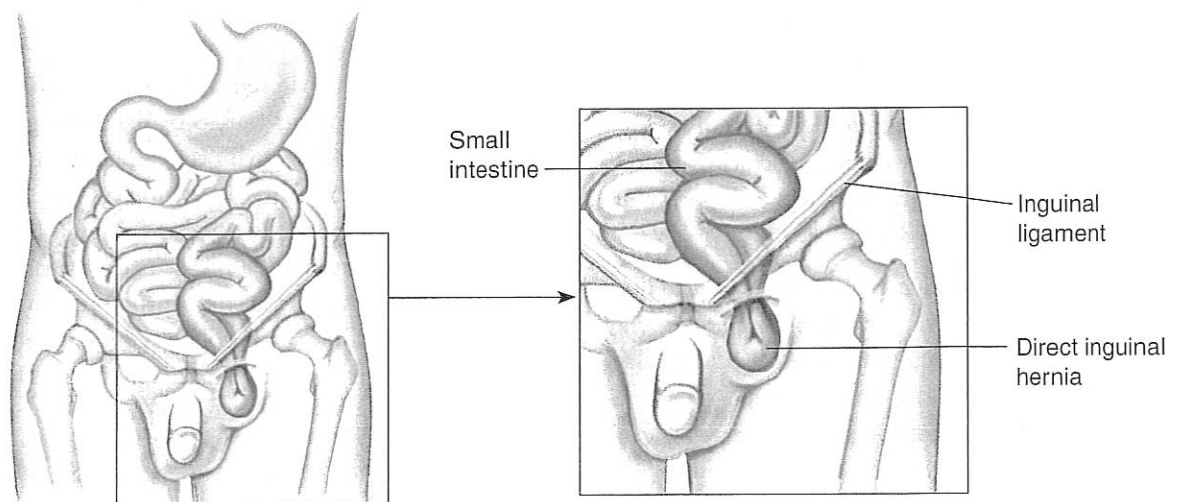


FIGURE 29-12 Inguinal hernia.

surgeries done in the United States. About 750,000 to 1 million people have hernia repairs each year. However, if an inguinal hernia does not cause any symptoms, treatment might not be necessary.

Irritable Bowel Syndrome

Irritable bowel syndrome (IBS) is a common disorder that interferes with normal colon function. It is considered a functional disorder, because it is thought to be a result of activity changes within the colon.

The exact cause of IBS is unclear; however, many factors may contribute to the functional change. A leading factor related to IBS is the impact of stress on the body and colon activity. Although a healthy person can have an upset stomach from a stressful situation, a person with IBS is more greatly impacted. The reason stress impacts the digestive system is the close neurological connection between the brain and the intestines. Postinfectious IBS is another factor related to this disorder in which IBS follows an intestinal infection. In this circumstance, a patient will be affected by IBS only temporarily. Hormonal changes related to the female reproductive cycle have also been shown to be a factor related to IBS. Symptoms related to IBS often worsen during menstruation. Women are twice as likely to suffer from IBS, and although it may occur at any age IBS most often begins in the late teen and early adult years. IBS affects 25 to 55 million Americans.

Signs and Symptoms. Common signs and symptoms associated with IBS include lower abdominal pain as well as cramping, bloating, nausea, and a feeling of gassiness. Changes in bowel function are a significant and troubling symptom, which can range from diarrhea to constipation or alternating between the two. Urgency is another common symptom, which is defined as the uncontrollable urge to defecate. Fecal matter may appear as a mucous-like, sticky fluid. The symptoms of IBS tend to rise and fall in intensity rather than worsen over time. A diagnosis of IBS is often made after a patient has experienced a combination of these symptoms for at least three days a month over a consecutive three-month period.

Treatment. There is no cure for IBS, and much about the condition remains poorly understood. Therefore, focus is placed on controlling symptoms and improving the day-to-day quality of life. Dietary and lifestyle changes along with psychologic treatment (to reduce anxiety and stress) are often helpful to eliminate or substantially reduce symptoms. Dietary recommendations include increasing fluid intake, incorporating high-fiber foods into the diet and avoiding problem foods, which often include caffeine, alcohol,

chocolate, and sodas. Lifestyle changes to consider include routine exercise and eating smaller meals throughout the day. Medications may also be prescribed based on the patient's individual needs to treat diarrhea, constipation, and abdominal pain and cramping.

Oral Cancer

Oral cancer is a form of cancer that can develop on the lips, on buccal mucosa (the inside of the lips and cheeks), on the gums, under the tongue, and on the front two thirds of the tongue. It can also develop on the hard palate of the mouth and the tissue located behind the wisdom teeth. Over 90 percent of oral cancer cases are linked to abnormal squamous cells that line the mouth.

The etiology of oral cancer is not linked to one specific cause. However, several factors increase the risk of developing it:

- Aging, particularly after 50
- Gender—more men develop oral cancer
- Smoking and heavy alcohol consumption, particularly if combined
- Using chewing tobacco or snuff, or chewing betel nut
- Excessive sun exposure to the lips
- Human papillomavirus (HPV)
- Poor dental hygiene
- Immunosuppressant medications

Signs and Symptoms. The signs and symptoms of oral cancer can be seen and felt quite early. Most commonly, sores, ulcers, irritation, or swelling in the mouth that lasts longer than two weeks should be checked by a doctor or dentist. Velvety red or white patches in the mouth may also indicate a precancerous condition. Other symptoms are a persistent

Professionalism The Workplace



Patients undergoing certain diagnostic testing for digestive disorders may be required to cleanse their bowels. This may be required for colon or sigmoidoscopies and other procedures. Often, patients are very anxious and apprehensive about this task. It is the responsibility of the medical assistant to provide the patient with both oral and written instruction regarding bowel preparation for certain diagnostic testing. The medical assistant may want to take extra care in discussing these sensitive topics and focus on the positive aspect of how proper test preparation can help provide ideal testing conditions—something both the patient and the physician will appreciate.

sore throat; sores under dentures; a lump in the lip, tongue, or neck; weight loss; unexplained bleeding in the mouth; swollen lymph nodes in the neck; and trouble chewing, swallowing, or speaking.

Treatment. Treatment of oral cancer depends on the extent and stage of the condition when diagnosed. Surgery to remove part or all of the tumor and some surrounding tissue may be required. Radiation and chemotherapy, which interfere with the cancer cells' ability to grow and spread, are other treatment options.

Pancreatic Cancer

The most common type of **pancreatic cancer** is called adenocarcinoma of the pancreas. This cancer develops in the exocrine glands of the pancreas. (Exocrine glands excrete a hormone or substance to target organs through ducts.) The pancreas also has endocrine glands (glands that secrete, not through ducts, but directly into the bloodstream). The endocrine glands of the pancreas can give rise to a completely different type of cancer, a very rare form called pancreatic neuroendocrine carcinoma, or islet cell tumor.

Pancreatic cancer is one of the deadliest of all cancers, because often it is not diagnosed until advanced later stages of the disease. The American Cancer Society states that only 6 percent of pancreatic cancer patients will survive for five years after diagnosis, but most will die within the first year. These statistics reflect the challenge in treating pancreatic cancer and the relative lack of curative options. Risk factors associated with developing pancreatic cancer include obesity, tobacco use, exposure to certain chemicals (some pesticides, dyes, and chemicals), age (the average age of those diagnosed is 71), gender (males are more likely to develop it), race (African Americans are more likely than Caucasians), genetic syndromes and family history, and other health conditions (diabetes, liver cirrhosis, and pancreatitis).

Signs and Symptoms. The signs and symptoms of pancreatic cancer are generally vague and can easily be attributed to other less serious and more common conditions. Unfortunately, signs and symptoms will often not appear until advanced stages. Early signs of this cancer include clay-colored stool, dark urine, and jaundice or yellowing of the skin. Upper abdominal pain or discomfort, weight loss, loss of appetite, nausea, and fatigue are also early indicators of the disease. Other signs and symptoms of pancreatic cancer may include back pain, blood clots, diarrhea, and indigestion.

Treatment. As with other forms of cancer, surgery, chemotherapy, and radiation may be used depending on the type and stage of the cancer. Surgery to completely remove the

cancerous tumor is the only known cure for pancreatic cancer. However, surgery is not an option for all forms of pancreatic cancer. In fact, only 15 to 20 percent of pancreatic cancers can be removed upon diagnosis. The Whipple procedure is the most common surgery performed to remove pancreatic cancer, involving removal of the head of the pancreas, part of the stomach, and a portion of the duodenum. A portion of the pancreas remains to allow for adequate production of digestive enzymes and insulin.

Peptic Ulcer Disease

Peptic ulcer disease (PUD) is characterized by a disruption in the lining of the esophagus, stomach, or duodenum (the upper part of the small intestine). PUD appears most frequently in the duodenum. Ulcers in the stomach are also common. As discussed earlier in the chapter, the stomach produces acid that breaks down food during the digestive process. A mucosal lining protects the stomach and duodenum from the acid. When the lining is damaged, tissue becomes exposed and irritation may cause an ulcer to form (Figure 29-13).

Etiology associated with most cases of PUD is an infection with the bacterium *Helicobacter pylori* (*H. pylori*), which can cause erosion of the stomach mucosa. Additionally, inflammation of the gastric lining is a common causative factor. Inflammation may occur because of an imbalance in secretion of acid and pepsin (an enzyme) as well as from a breakdown in the defenses of the mucosal lining. Inflammation may be aggravated by the use of aspirin or nonsteroidal antiinflammatory drugs (NSAIDs) such as ibuprofen.

Ulcers can be prevented by avoiding alcohol and tobacco and limiting the use of NSAIDs and aspirin. Spicy foods do not cause ulcers but can aggravate symptoms associated with the condition.

Signs and Symptoms. The most common signs and symptoms of PUD are abdominal pain, nausea, vomiting, and weight loss. Esophageal ulcers often cause heartburn and chest pain. Other symptoms include tarry black or maroon stools (indicating the presence of old blood) or bright red blood in the stools (fresh blood), and a burning or gnawing pain in the stomach or the back.

Stomach or gastric ulcers are more common in people over the age of 50. Mild symptoms may be mistaken for indigestion or heartburn. Symptoms and signs may include any or all of the following:

- Pain or a burning sensation (similar to indigestion) in the upper abdomen and sometimes the lower chest
- Pain that is made worse by eating; however, pain from a duodenal ulcer can be worse when the stomach is

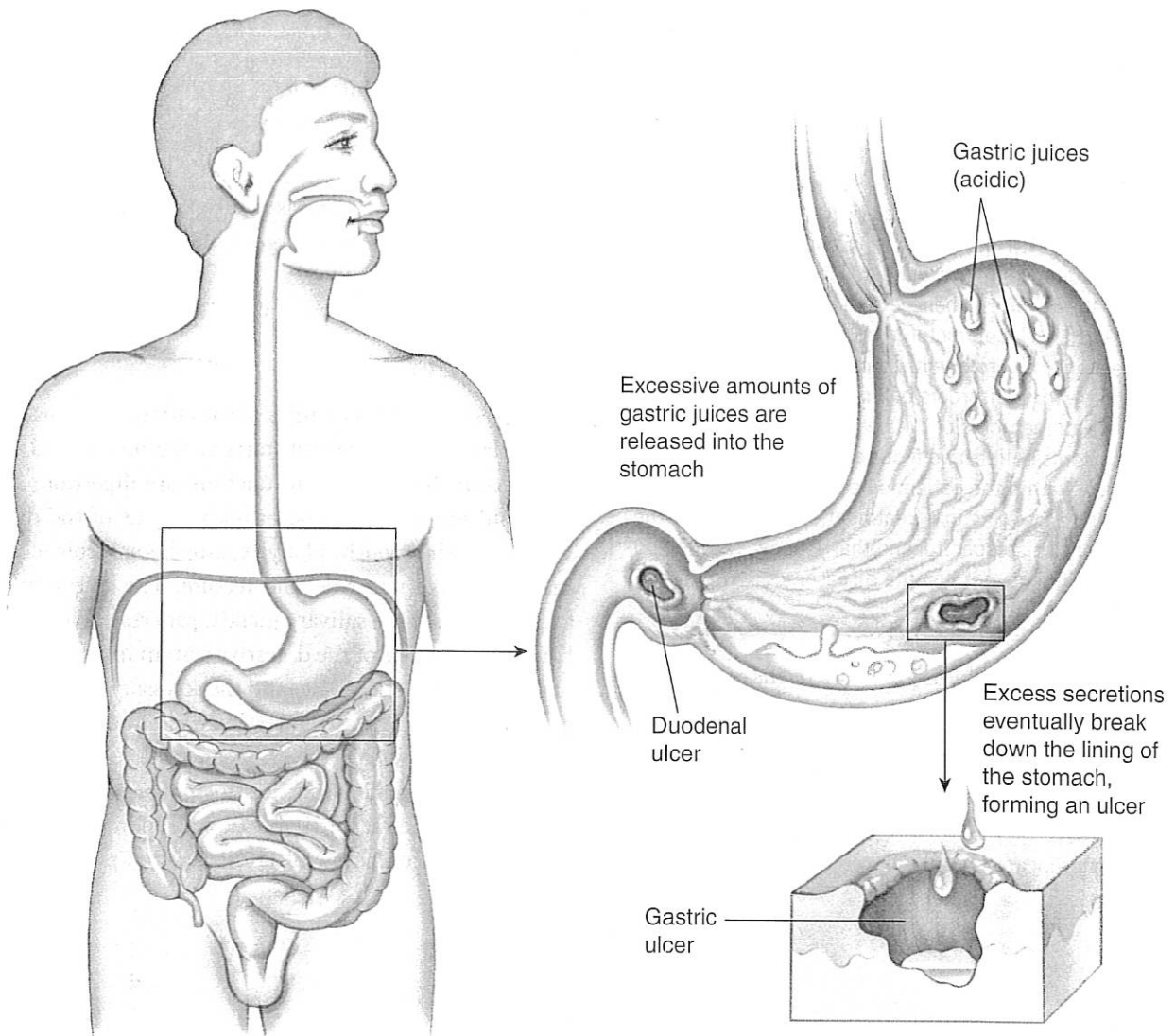


FIGURE 29-13 Peptic ulcer disease (PUD).

empty and is relieved by eating, but then recurs a few hours afterward

- Difficulty swallowing or regurgitation (bringing up swallowed food into the mouth)
- Bloating, retching, and feeling sick, particularly after eating
- Vomiting and nausea
- Loss of appetite and weight loss

The presence of blood in the stool may indicate that an ulcer is bleeding, which points to a more severe condition. Bleeding may mean that an ulcer has eaten its way through the wall of the stomach or duodenum. Also of concern is that the ulcer is blocking the digestive tract, and making it difficult for food to leave the stomach.

Treatment. Treatment of PUD depends on the cause and severity of the ulcer. Tobacco and alcohol should be avoided

because they delay healing. Antibiotics may be given to treat *H. pylori* infections. Any medications that may cause or aggravate the condition must be changed. Proton pump inhibitors, such as Prevacid and Protonix, are medications that promote healing and block the production of acid. Medications may be prescribed to protect the stomach by decreasing or stopping the secretion of stomach acids. These are termed histamine (H₂) blockers and examples include Zantac and Pepcid. Both proton pump inhibitors and H₂ blockers are available by prescription as well as over the counter.

Occasionally, surgery may be required if the ulcer does not respond to medication or to stop a bleeding ulcer that is not responding to other therapies.

Pyloric Stenosis

The pylorus is the connection between the stomach and the duodenum. **Pyloric stenosis** is a condition that develops in

Professionalism

Cultural Considerations



Culture can play a major role in how people eat and view disorders of the digestive system. Hindus, for example, believe in fasting and in eating a specific way. Jews have specific dietary restrictions and customs associated with the preparation and eating of meals, particularly around religious holidays. Other cultures, such as those in the Far East, believe that alternative medicine therapies, such as acupuncture, homeopathy, meditation, and biofeedback, are frequently more useful than Western medicine in treating disorders of the digestive system. It is important for all members of the health care team to always respect a person's beliefs and focus on supporting and treating the patient within the patient's belief system. When asking questions or assisting in a treatment, make sure that the questions are not disrespectful and that your care is directed at the "total" patient, not just the disease.

some infants when the pylorus gradually swells and thickens, interfering with the flow of food into the intestine. This disorder can occur anytime between birth and 6 months of age but most commonly develops about three weeks after birth.

Signs and Symptoms. The main symptom of pyloric stenosis is an infant's repeated vomiting after feeding. The vomit-

ing usually starts gradually and worsens over time. As the pylorus constricts, the vomiting becomes more frequent and more forceful. The infant loses weight, develops symptoms of dehydration, is sleepier than normal, and is very fussy when awake.

Treatment. Pyloric stenosis is always treated with surgery (pyloromyotomy). After surgery, the disorder usually does not develop again.

SUMMARY

The digestive system consists of the alimentary canal, which is tubular in structure and starts at the mouth and ends at the rectum. Its three main functions are digestion, absorption, and elimination. The primary organs of the digestive system are the mouth, pharynx, esophagus, stomach, small intestine, large intestine, and rectum. The accessory organs of digestion are the salivary glands, pancreas, liver, and gallbladder. Disorders of the digestive system involve the organs of the gastrointestinal tract and the accessory organs. Among the diseases of the gastrointestinal system are appendicitis, cirrhosis, colitis, colorectal cancer, Crohn's disease, diverticulitis and diverticulosis, gastroesophageal reflux disease, hemorrhoids, hernias, irritable bowel syndrome, oral cancer, pancreatic cancer, peptic ulcer disease, and pyloric stenosis.

29 CHAPTER REVIEW

COMPETENCY REVIEW

1. Define and spell the terms for this chapter.
2. Name the primary organs associated with digestion.
3. What are the four accessory organs of digestion?
4. What are the three main functions of the digestive system?
5. What is the first portion of the small intestine called?
6. The colon, a part of the large intestine, can be divided into four distinct sections. Name them.
7. What is the function of the gallbladder?
8. What saclike organ converts food into a semiliquid form called chyme?
9. With how many deciduous teeth is a person born?
10. What are the many essential roles of the liver?

PREPARING FOR THE CERTIFICATION EXAM

1. Which of the following is found on the right side of the abdomen?
 - a. ascending colon
 - b. descending colon
 - c. cecum
 - d. transverse colon
 - e. sigmoid colon