which serves to clear nondigestible residue from the small intestine (the intestinal "housekeeper"). This organized, propagated series of contractions lasts, on average, 4 min, occurs every 60–90 min, and usually involves the entire small intestine. After food ingestion, the small intestine produces irregular, mixing contractions of relatively low amplitude, except in the distal ileum where more powerful contractions occur intermittently and empty the ileum by bolus transfers.

ILEOCOLONIC STORAGE AND SALVAGE

The distal ileum acts as a reservoir, emptying intermittently by bolus movements. This action allows time for salvage of fluids, electrolytes, and nutrients. Segmentation by haustra compartmentalizes the colon and facilitates mixing, retention of residue, and formation of solid stools. There is increased appreciation of the intimate interaction between the colonic function and the luminal ecology. The resident microorganisms, predominantly anaerobic bacteria, in the colon are necessary for the digestion of unabsorbed carbohydrates that reach the colon even in health, thereby providing a vital source of nutrients to the mucosa. Normal colonic flora also keeps pathogens at bay by a variety of mechanisms. In health, the ascending and transverse regions of colon function as reservoirs (average transit time, 15 h), and the descending colon acts as a conduit (average transit time, 3 h). The colon is efficient at conserving sodium and water, a function that is particularly important in sodium-depleted patients in whom the small intestine alone is unable to maintain sodium balance. Diarrhea or constipation may result from alteration in the reservoir function of the proximal colon or the propulsive function of the left colon. Constipation may also result from disturbances of the rectal or sigmoid reservoir, typically as a result of dysfunction of the pelvic floor, the anal sphincters, the coordination of defecation, or dehydration.

COLONIC MOTILITY AND TONE

The small intestinal MMC only rarely continues into the colon. However, short duration or phasic contractions mix colonic contents, and high-amplitude (>75 mmHg) propagated contractions (HAPCs) are sometimes associated with mass movements through the colon and normally occur approximately five times per day, usually on awakening in the morning and postprandially. Increased frequency of HAPCs may result in diarrhea or urgency. The predominant phasic contractions in the colon are irregular and non-propagated and serve a "mixing" function.

Colonic tone refers to the background contractility upon which phasic contractile activity (typically contractions lasting <15 s) is superimposed. It is an important cofactor in the colon's capacitance (volume accommodation) and sensation.

COLONIC MOTILITY AFTER MEAL INGESTION

After meal ingestion, colonic phasic and tonic contractility increase for a period of ~2 h. The initial phase (~10 min) is mediated by the vagus nerve in response to mechanical distention of the stomach. The subsequent response of the colon requires caloric stimulation (e.g., intake of at least 500 kcal) and is mediated, at least in part, by hormones (e.g., gastrin and serotonin).

DEFECATION

Tonic contraction of the puborectalis muscle, which forms a sling around the rectoanal junction, is important to maintain continence; during defecation, sacral parasympathetic nerves relax this muscle, facilitating the straightening of the rectoanal angle (Fig. 55-1). Distention of the rectum results in transient relaxation of the internal anal sphincter via intrinsic and reflex sympathetic innervation. As sigmoid and rectal contractions, as well as straining (Valsalva maneuver), which increases intraabdominal pressure, increase the pressure within the rectum, the rectosigmoid angle opens by >15°. Voluntary relaxation of the external anal sphincter (striated muscle innervated by the pudendal nerve) in response to the sensation produced by distention permits the evacuation of feces. Defecation can also be delayed voluntarily by contraction of the external anal sphincter.

DIARRHEA

DEFINITION

Diarrhea is loosely defined as passage of abnormally liquid or unformed stools at an increased frequency. For adults on a typical Western diet, stool weight >200 g/d can generally be considered diarrheal. Diarrhea may be further defined as *acute* if <2 weeks, *persistent* if 2–4 weeks, and *chronic* if >4 weeks in duration.

Two common conditions, usually associated with the passage of stool totaling <200 g/d, must be distinguished from diarrhea, because diagnostic and therapeutic algorithms differ. *Pseudodiarrhea*, or the frequent passage of small volumes of stool, is often associated with rectal urgency, tenesmus, or a feeling of incomplete evacuation, and accompanies IBS or proctitis. *Fecal incontinence* is the involuntary discharge of rectal contents and is most often caused by neuromuscular disorders or structural anorectal problems. Diarrhea and urgency, especially if severe, may aggravate or cause incontinence. Pseudodiarrhea and fecal incontinence occur at prevalence rates comparable to or higher than that of chronic diarrhea and should always be considered in patients complaining of "diarrhea." Overflow diarrhea may occur in nursing home patients due to fecal impaction that is readily detectable by rectal examination. A careful history and physical examination generally allow these conditions to be discriminated from true diarrhea.

ACUTE DIARRHEA

More than 90% of cases of acute diarrhea are caused by infectious agents; these cases are often accompanied by vomiting, fever, and abdominal pain. The remaining 10% or so are caused by medications, toxic ingestions, ischemia, food indiscretions, and other conditions.

Infectious Agents Most infectious diarrheas are acquired by fecal-oral transmission or, more commonly, via ingestion of food or water contaminated with pathogens from human or animal feces. In the immunocompetent person, the resident fecal microflora, containing >500 taxonomically distinct species, are rarely the source of diarrhea

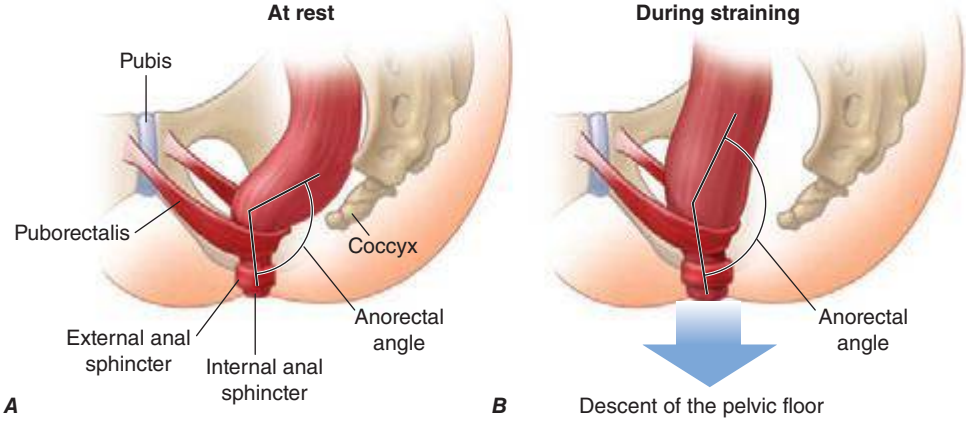

FIGURE 55-1 Sagittal view of the anorectum (*A*) at rest and (*B*) during straining to defecate. Continence is maintained by normal rectal sensation and tonic contraction of the internal anal sphincter and the puborectalis muscle, which wraps around the anorectum, maintaining an anorectal angle between 80° and 110°. During defecation, the pelvic floor muscles (including the puborectalis) relax, allowing the anorectal angle to straighten by at least 15°, and the perineum descends by 1–3.5 cm. The external anal sphincter also relaxes and reduces pressure on the anal canal. *(Reproduced with permission from A Lembo, M Camilleri: N Engl J Med 349:1360, 2003.)*