

Radiologic Decision-Making

Diagnostic Imaging in the Evaluation of Constipation in Adults

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Acute and chronic constipation are common conditions. In most instances, a thorough history and digital rectal examination provide sufficient information to begin treatment. Occasionally, imaging studies can be useful to confirm the presence of a suspected abnormality. The acute onset of constipation suggests colonic obstruction. Plain abdominal radiographs may be sufficient to determine the level and cause of the obstruction, such as sigmoid or cecal volvulus. Barium enema radiographic examination or colonoscopy may also be useful to detect the cause of obstruction. In patients with chronic constipation, plain abdominal radiographs can be used to show the extent of fecal impaction. Colonic transit time can be assessed on serial abdominal radiographs after the patient has ingested radiopaque markers. Evacuation proctography can be used to diagnose a variety of functional disorders of the rectum and anus, such as rectocele, intussusception and abnormal perineum floor descent.

Constipation can be defined as infrequent bowel movements, the passage of hard stool or difficulty in passing stool. Constipation is a common complaint that may be associated with other symptoms, such as painful defecation, bloating and fecal incontinence.¹ A wide variation in frequency of evacuation occurs in the normal adult population, from three times per day to three times per week. A decrease in the patient's normal evacuation frequency requires further evaluation.

In most cases, the cause of constipation can be determined by obtaining a careful history (Table 1). The history may reveal inadequate water and fiber intake, use of medications that can cause constipation, and various metabolic and psychogenic disorders that may be associated with constipation. Treatment of the underlying disorder usually leads to the resolution of symptoms.²

TABLE 1

Causes of Acute and Chronic Constipation*

Functional	Neuromuscular abnormalities	Metabolic and endocrine disorders	Cation-containing agents
Inadequate water and fiber intake	Scleroderma	Hypothyroidism	Aluminum (antacids, sucralfate)
Failure to respond to the urge to defecate	Myotonic dystrophy	Diabetes mellitus	Calcium (antacids, supplements)
Intrinsic disease of the colon	Diverticulosis	Hypokalemia	Bismuth
Stenosis and obstruction	Hirschsprung's disease	Hyperkalemia	Iron supplements
Tumors	Intestinal pseudo-obstruction	Hypercalcemia	Miscellaneous
Diverticulitis	Meningocele	Uremia	Calcium channel blockers
Volvulus	Amyloidosis	Medications	Opiates
Hernias	Functional disorders of the anus and rectum	Anticholinergics	Vinca alkaloids
Endometriosis	Rectocele	Antidepressants	
Ischemic colitis	Enterocoele	Antipsychotics	
	Intussusception	Antiparkinsonian agents	
	Descending perineum syndrome		

*—This table represents a partial listing of the numerous causes of constipation. Consult standard textbooks for more complete information.

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TABLE 2

Imaging Techniques to Identify the Etiology of Acute and Chronic Constipation

<i>Imaging technique</i>	<i>Indications</i>	<i>Cost*</i>
Plain abdominal radiographs	Suspected obstructive lesion (e.g., cancer) or fecal impaction	\$ 70
Barium enema	Presence of structural colonic lesion	175
Colonic transit studies	Chronic constipation or infrequent defecation	70
Evacuation proctography (defecography)	Chronic constipation or functional abnormality of the rectum or anus	165
Ancillary studies		
Anorectal or colonic manometry	Anorectal neuromuscular abnormality	350
Colonoscopy or flexible sigmoidoscopy	Obstructing lesion; perform colorectal biopsy	675

*—Costs are derived from current charges at the University of Iowa Hospitals and Clinics, Iowa City.

Various abnormalities, including anal fissures, strictures and stenosis, can be identified by rectal examination. Digital rectal examination can reveal the integrity of the anal sphincter. For example, a patulous or asymmetric anal sphincter suggests a neurologic disorder such as a spinal cord injury or peripheral neuropathy. An anorectal mass may also be palpated digitally. The presence of fecal blood requires further investigation.² Although most cases of con-

stipation can be evaluated and managed without the need for extensive diagnostic testing, radiologic techniques may be helpful in problematic cases (Table 2).

Acute Constipation

Acute constipation, defined as the abrupt cessation of the passage of stool and flatus, usually indicates colonic obstruction (Table 3). Plain abdominal radiographs may show the level of obstruction, and radiographic contrast studies can confirm the cause before definitive therapy is initiated.³

ILLUSTRATIVE CASE 1

A 65-year-old man presented to the emergency room with a five-day history of inability to pass fecal material or flatus. The patient usually passed one formed stool per day. Remaining history was unremarkable. Digital rectal examination was normal. Plain radiographs showed colonic dilatation to the level of the sigmoid colon (Figure 1a and 1b). Examination with barium enema demonstrated irregular mucosa at the rectosigmoid junction (Figure 1b). Flexible sigmoidoscopy showed a mass, and biopsy of the mass revealed a cancer, which was ultimately resected.

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TABLE 3

Causes of Colonic Obstruction in Adults

Common

- Colorectal carcinoma
- Diverticulitis
- Sigmoid or cecal volvulus
- Fecal impaction

Uncommon

- Adhesions
- External/internal hernias
- Pelvic abscess
- Presence of a foreign body

PLAIN ABDOMINAL RADIOGRAPHS

In adult patients presenting with acute constipation, plain abdominal radiographs frequently provide useful information regarding the level of fecal obstruction.⁴ Radiographs are obtained with the patient supine and standing. Volvulus is typically manifested by a focal dilation of the sigmoid or cecal colonic segments.⁵ Colon cancer, especially in the sigmoid area, may be signified by moderate dilation of the proximal air-filled colon, multiple air-fluid levels and abrupt termination of air at the site of the tumor.⁶ Colon perforation occurs in 7 percent of cases of large bowel obstruction.⁷ Thus, upright (standing) abdominal radiographs are useful for the detection of free intraperitoneal air.

BARIUM ENEMA

In patients suspected of having colonic obstruction, a barium enema can be useful in determining the level and often the general nature of the obstruction.³ The examination is performed by fluoroscopic monitoring of the barium contrast column. Abrupt irregular termination of the barium column suggests colon cancer, whereas smooth tapering is seen in sigmoid or cecal volvulus.⁸ Colonic narrowing with mucosal preservation and a "sawtooth" appearance suggests diverticulitis.

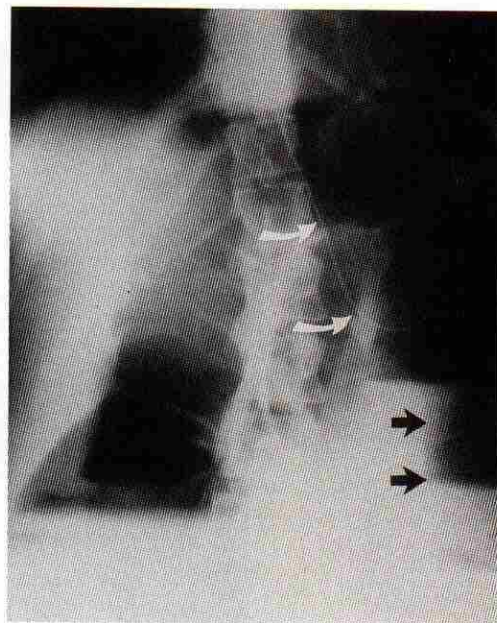


FIGURE 1A. Plain upright abdominal radiograph of a 65-year-old man with a five-day history of constipation shows marked colonic dilatation and air-fluid levels to the sigmoid colon (black arrows). A nasogastric tube is present in the stomach (curved arrows).

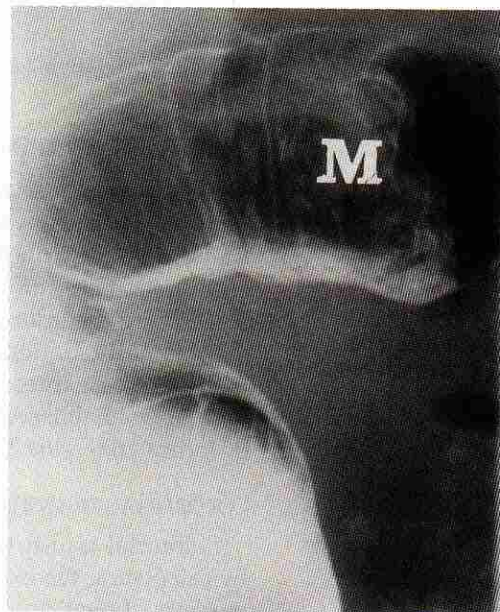


FIGURE 1B. Double-contrast barium enema in the same patient as in Figure 1a shows abrupt nodular termination of the contrast column at the sigmoid colon. The appearance of the sigmoid colon is compatible with colon cancer. A sigmoid resection showed colon cancer. (M = mass)

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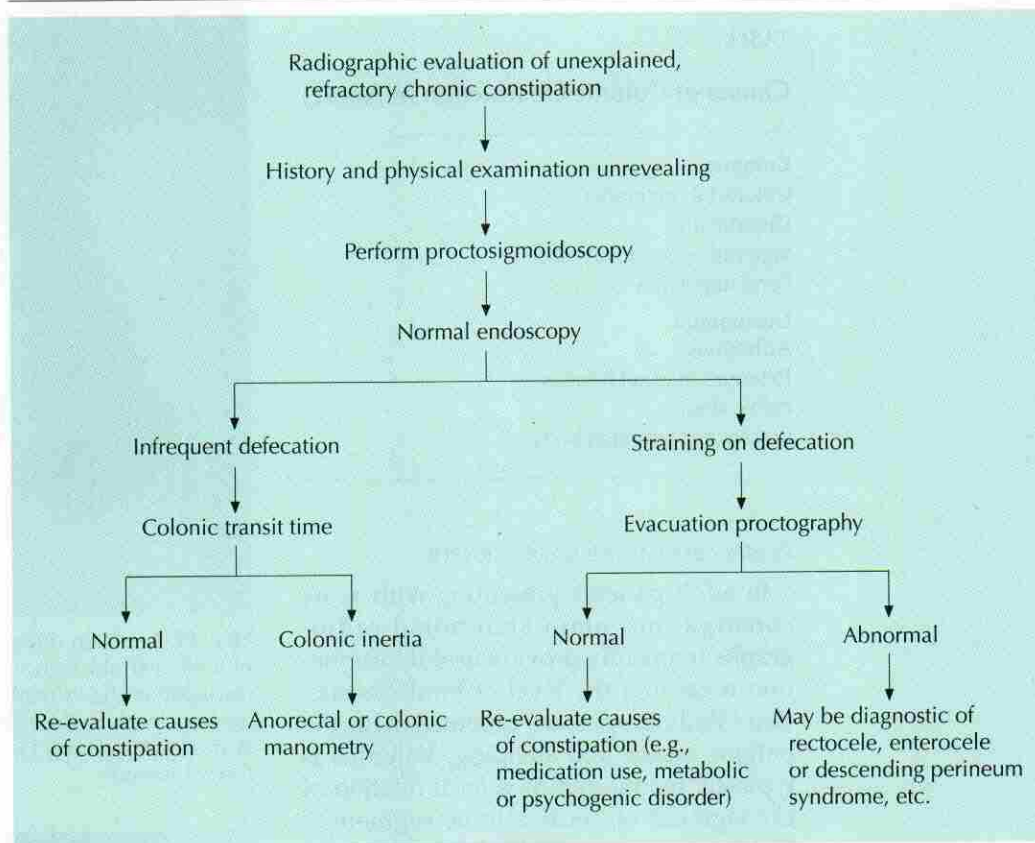


FIGURE 2. Algorithm for radiographic evaluation of unexplained refractory chronic constipation.

Chronic Constipation

In most patients with chronic constipation (persisting for weeks, months or even years), a thorough history and digital rectal examination are sufficient to determine the underlying disorder and begin treatment. Occasionally, patients fail to respond to treatment or express dissatisfaction with their bowel habits. Additional studies may be indicated (Figure 2).

COLORECTAL TRANSIT EXAMINATION

Colorectal transit time can be measured by calculating the expulsion of radiopaque markers shown on plain abdominal radiographs.⁹ Colorectal transit time can be measured by having the patient ingest one capsule containing 24 markers (Sitzmarks) each day for four to five days; a steady state is reached when the number of mark-

ers entering the gastrointestinal tract is equal to the number leaving the gastrointestinal tract. The transit time in hours is equal to the number of markers still shown on the plain film radiographs.¹⁰ In addition, radiopaque marker distribution may be related to the underlying abnormality. Retention of evenly distributed markers throughout the entire colon suggests a generalized colon inertia, whereas retention only in the rectum may be caused by an outlet abnormality.

COLONIC CONTRAST STUDIES

A variety of structural lesions may be defined by either single- or double-contrast barium enema examinations. Fecal impaction is common, especially in debilitated elderly or sedentary institutionalized patients (Figures 3a through 3c). Plain abdominal films usually show one or several large

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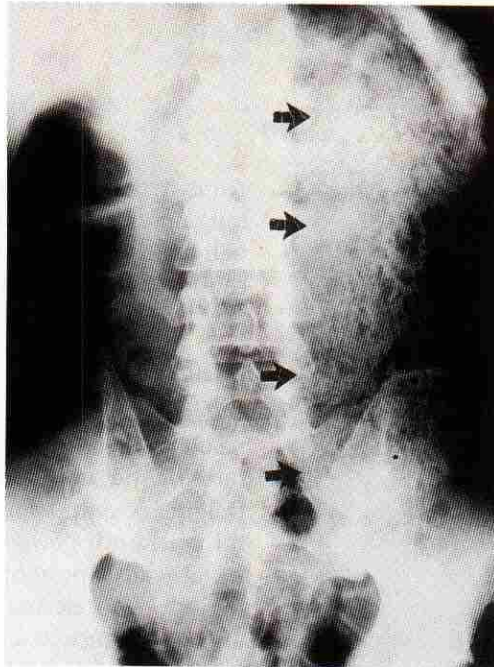


FIGURE 3A. Plain supine abdominal radiograph of a 36-year-old woman with Hirschsprung's disease and chronic constipation. Retention of fecal material (fecaloma) in a dilated segment of the sigmoid and descending colon represents fecal impaction (arrows).

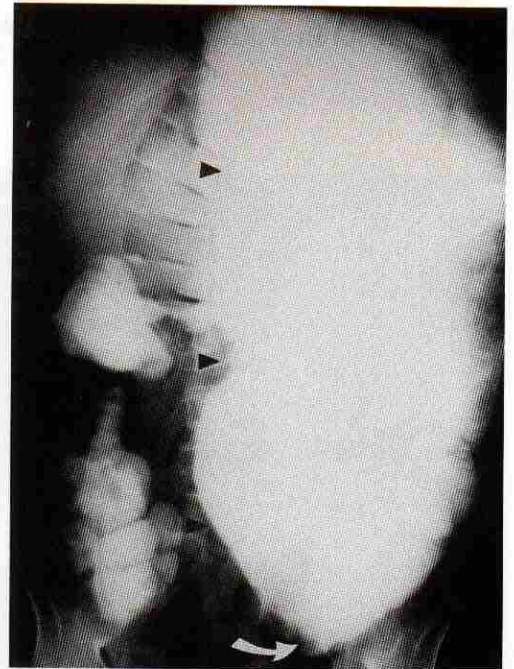


FIGURE 3B. Single-contrast barium enema in the same patient as in Figure 3a shows a dilated descending colon (arrowheads) with smooth tapering of the distal colonic segment (curved arrow).

fecal masses, called fecalomas. Barium contrast studies show intraluminal masses without mucosal attachment.

Previously, water-soluble contrast studies were used to treat uncomplicated fecal impaction in adults.¹¹ Digital removal of the fecaloma followed by warm-water or saline enemas is usually sufficient to remove impacted material. A follow-up plain abdominal radiograph can determine whether evacuation was successful. If a structural lesion is suspected, a barium enema examination or colonoscopy is indicated.

EVACUATION PROCTOGRAPHY

Patients with chronic constipation may complain of unusual straining during defecation, a sensation of incomplete evacuation or fecal incontinence. Evaluation of patients with unexplained, refractory constipation is outlined in Figure 2. Evacuation proctography (also called defecography) provides dynamic assessment of defecation and can be useful to detect rectocele, enterocele, rectal intussusception and abnormal perineal descent.¹²

The examination consists of opacifying the rectum with thick barium sulfate paste

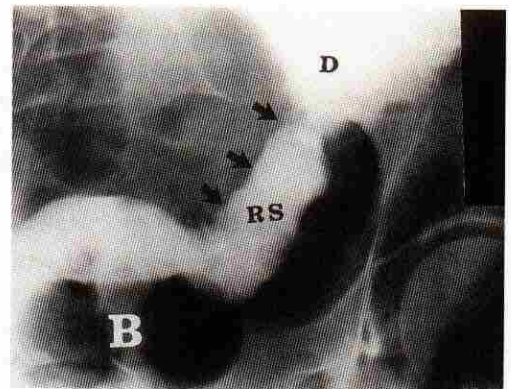


FIGURE 3C. Spot radiograph shows uniform narrowing of the sigmoid colon (arrows). Biopsy showed aganglionosis consistent with adult Hirschsprung's disease. (B = rectal balloon catheter; RS = sigmoid colon; D = descending colon)

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to simulate normal fecal material. After the introduction of barium into the rectum, the patient sits on a radiolucent commode and performs a series of maneuvers to test the continence mechanism and measure the descent of the pelvic floor muscles. Defecation and post-defecation filming is then performed to determine the completeness of evacuation.^{13,14} Normal findings during evacuation proctography include an increase in the anorectal angle, loss of the

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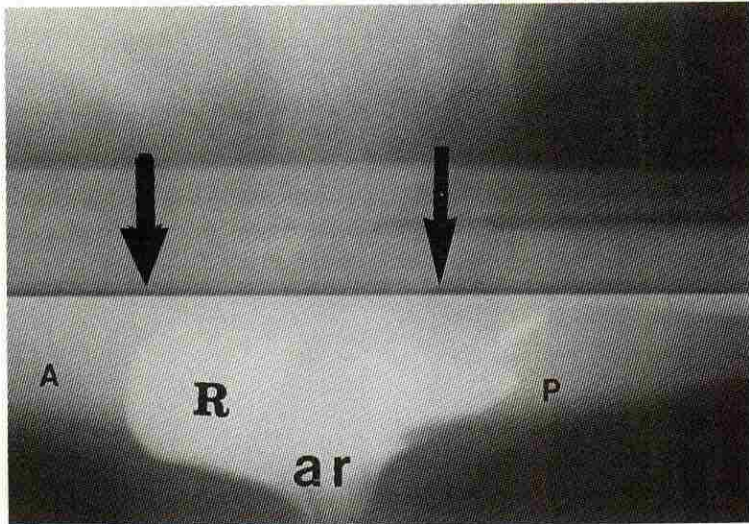


FIGURE 4A. Evacuation proctography in a 70-year-old woman presenting with chronic constipation and a sensation of incomplete evacuation. Note the large anterior rectocele (arrows). (R = rectocele; ar = anorectal junction; A = anterior; P = posterior)

puborectalis impression, opening of the anal canal to approximately 1.5 cm and descent of the anorectal junction to less than 3.5 cm from its resting position near the level of the ischial tuberosities.^{3,13}

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ILLUSTRATIVE CASE 2

A 70-year-old woman presents because of chronic constipation and a sensation of incomplete fecal evacuation. The patient has taken laxatives without improvement.

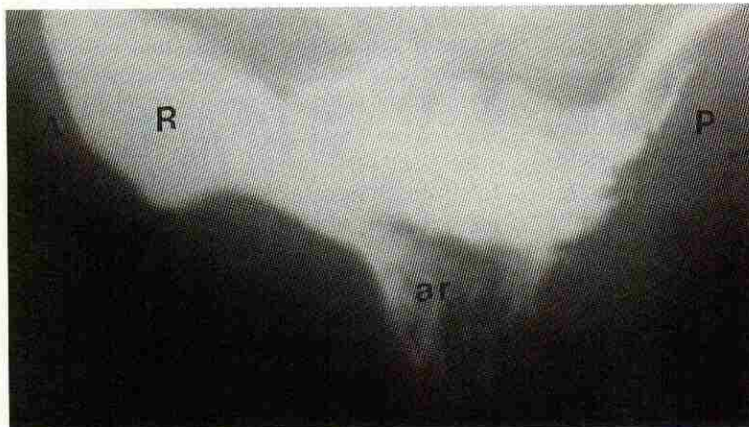


FIGURE 4B. During evacuation, the rectocele trapped the rectal contents, resulting in incomplete evacuation. (ar = anorectal junction; R = rectocele; A = anterior; P = posterior)

An evacuation proctogram demonstrated bulging of the anterior rectal wall that partially occluded the anal canal during defecation, resulting in retention of barium contrast material (Figures 4a and 4b).

RECTOCELE

Rectocele usually occurs in women as a result of obstetric injury and reflects weakness of the anterior rectovaginal wall.¹⁵ Bulging or outpouching of the anterior rectal wall and, occasionally, the posterior rectal wall is present on proctography. Although rectocele may be asymptomatic, it also may cause a sensation of incomplete evacuation. A symptomatic rectocele is frequently associated with intussusception that may obstruct the anal canal.

INTUSSUSCEPTION

Rectal intussusception is a concentric invagination of the rectal wall, which may progress to the anal canal (Figure 5a and 5b).¹⁶ Intussusception begins 6 to 8 cm above the anal canal at the level of the main rectal fold (valves of Houston). These rectal intussusceptions may remain internal (intrarectal), travel down the entire anal canal (intra-anal), or result in complete rectal prolapse. Symptoms of obstructed defecation occur if the intussusception plugs the anal canal. Ulceration of the rectal mucosa may occur with repeated intussusception.^{12,16}

ENTEROCELE

An enterocele is a herniation of the lining of the peritoneum into the cul-de-sac, which typically occurs in women who have undergone pelvic surgery.¹⁶ During evacuation proctography, separation between the vagina and the anterior wall of the rectum occurs, which is experienced by the patient as pressure on the perineum. If small bowel herniation is suspected, a barium study can be helpful. The patient drinks 300 mL of barium sulfate one hour before the examination to opacify the bowel and thereby determine the level of herniation. Herniation may extend to the anterior wall of the anus.

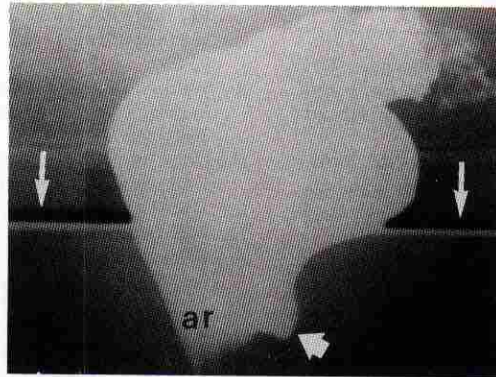


FIGURE 5A. Evacuation proctography in a 67-year-old woman with a long history of chronic constipation and straining during defecation. At rest, there is a small posterior rectocele (*short arrow*) and inferior displacement of the anorectal junction greater than 3.5 cm from the level of the ischial tuberosities, representing descending perineum syndrome. The edge of the radiolucent commode (*long arrows*) can be seen. This patient also had fecal incontinence with coughing. (ar = anorectal junction)

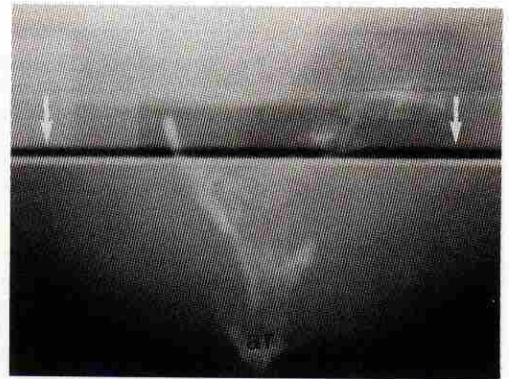


FIGURE 5B. Spot radiograph obtained after evacuation shows severe intra-anal intussusception (intra-anal rectal prolapse) in the same patient as in Figure 5a. The edge of the radiolucent commode (*arrows*) can be seen. (ar = anorectal junction)

DESCENDING PERINEUM SYNDROME

In patients with descending perineum syndrome, the tone of the pelvic floor muscles is diminished, resulting in prolapse of the anterior rectal wall with excessive straining.¹² During the straining maneuvers, the anal canal descends more than 3.5 cm from its resting position near the inferior plane of the ischial tuberosities. Pudendal nerve injury may occur during chronic straining, leading to neuropathic injury of the external anal sphincter.¹⁷ About 50 percent of patients with descending perineum syndrome will also experience fecal incontinence.¹⁷

MISCELLANEOUS CONDITIONS

During normal defecation, there is reflex inhibition of the puborectalis muscle and relaxation of the internal and external anal sphincters.⁸ Incomplete evacuation during defecation may occur as a result of an abnormal hypertonic puborectalis muscle. Solitary rectal ulcer syndrome results from trauma to the leading edge of intussusception during straining against a nonrelaxing pelvic floor.¹² Most ulcers occur 6 to 8 cm above the anal verge on the anterior rectal

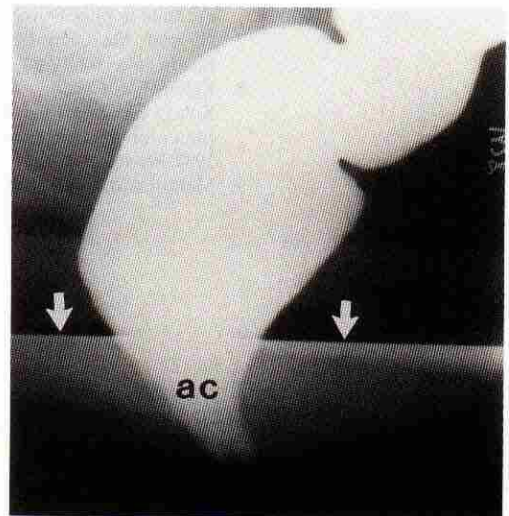


FIGURE 6. Evacuation proctography in a 58-year-old man with a history of chronic constipation and fecal incontinence. A wide anorectal canal at rest is shown, consistent with fecal incontinence. The edge of the radiolucent commode (*arrows*) can be seen. (ac = open anorectal canal)

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wall. Fecal incontinence is commonly associated with intussusception and abnormal pelvic floor descent. Patients with chronic constipation will typically have a low anorectal junction, probably resulting from constant straining. This can cause pudendal neuropathy and an abnormally lax anal sphincter. Evacuation proctography may show a patulous anal canal at rest (*Figure 6*).

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