Diverticulitis

Kelly P. O’Keefe and Tracy G. Sanson

PATHOPHYSIOLOGY

DIVERTICULOSIS

Diverticula are thought to arise from defects in the muscularis layer of the intestines (Fig. 35.1) and are related to abnormalities in muscle tone and increased intraluminal pressure; saclike protrusions eventually form at points of weakness. If stool is caught in these saclike protrusions, it becomes inspissated and hardened and causes abrasions of the mucosa that lead to inflammation, although the same end result can occur from pressure differentials alone without the presence of trapped fecal material.

Diverticula generally form at a site of focal weakness in the wall of the bowel, such as the location of blood vessel penetration (vasa recta). The mucosal and submucosal layers herniate through the muscular layer of the intestine, with only a covering of serosa remaining. This leads to an inherent weakness in the diverticular sac relative to the normal bowel. Only thinned layers of mucosa protect blood vessels, which are subject to stretching and thinning of their media, thereby predisposing to weakness and rupture of the vascular tissue.

The left side of the colon is the most common site for diverticulosis in patients with westernized diets and lifestyle. Right-sided diverticula occur more frequently in certain Asian populations. Right-sided diverticula have a higher rate of hemorrhage because of anatomic differences in their development. Small bowel diverticula occur most commonly in the duodenum, where they are predominantly asymptomatic. About 20% of small bowel diverticula occur in the jejunum or ileum; complications develop in these diverticula at rates three times greater than in duodenal diverticula.

A low-fiber diet and constipation may contribute to the development of diverticular disease. High-fiber diets that prevent constipation clearly lead to fewer relapses of diverticulitis and less frequent complications. Lack of physical activity and advanced age are both believed to increase the incidence of the disease. Men and women are affected equally.

DIVERTICULITIS

Diverticulitis arises from the initial microperforation of a diverticulum (Table 35.1). The process starts with blockage of the colonic opening of the diverticulum or by direct contact with food and fecal particles lodged in the affected portion of the bowel. Increased intraluminal or direct local pressure causes erosion of the diverticular wall, which leads to inflammatory changes, focal necrosis, and eventually perforation. The process is generally mild and limited by local pericolic fat and mesentery. Virtually all cases of diverticulitis involve perforation of the intestines, with the course of the resultant
illness determined by the extent of this perforation. Complicated diverticulitis refers to regional spread of the inflammatory process by the formation of larger abscesses, a fistula with adjacent organs, or peritonitis (Fig. 35.2). Patients with purulent peritonitis have a mortality rate of 6%, which rises to 35% when fecal soilage of the peritoneal cavity occurs. Patients with diverticular disease occasionally have segmental colitis of the sigmoid colon, probably from fecal stasis or localized ischemia. The effects can be mild or may resemble those of inflammatory bowel disease.1

**PRESENTING SIGNS AND SYMPTOMS**

**HISTORY AND PHYSICAL EXAMINATION**

A focused history and physical examination are important in making the diagnosis of diverticular disease. Essential historical elements are bowel habits, diet, elucidation of classic symptoms, and previous occurrence. Physical examination should assess for hemodynamic stability, the presence of peritonitis, and occult or obvious hemorrhage. Complete abdominal, genitourinary, and rectal examinations must be documented.
The classic manifestation of diverticulitis involves several days of worsening left lower quadrant abdominal pain. Low-grade fever commonly develops but is not uniformly present. Patients typically report similar past episodes of pain and fever. Other common symptoms are nausea, vomiting, constipation (50%), and diarrhea (40%). Urinary symptoms (dysuria, urgency, frequency) caused by local inflammation of the bladder occur in only 10% of patients. Fever is often absent in elderly patients, and a rectal temperature may be required for detection of fever in this population. Dementia, polypharmacy, and other causes of chronically altered mental status may complicate diagnostic accuracy; imaging should be used liberally in these patients. Signs of peritonitis may be minimal or absent in even the most fully competent and communicative older patient.

**RED FLAGS**

Hospitalize patients with signs and symptoms of systemic illness, even without clear peritonitis.
Consider risk factors for abdominal aortic aneurysm and mesenteric ischemia.
Rectal findings can be negative or normal in a patient with episodic diverticular bleeding.

**DIFFERENTIAL DIAGNOSIS**

Box 35.1 presents the differential diagnosis for suspicion of diverticulitis.

**DIAGNOSTIC TESTING**

**LABORATORY TESTS**

Leukocytosis is noted in only half of patients with diverticulitis. Disease severity, advancing age, and underlying health status affect the white blood cell count; it may not be elevated in elderly patients or the chronically ill even with significant acute disease. Similarly, hemoglobin levels may not accurately reflect the severity of recent diverticular bleeding. Urinalysis should be performed to evaluate any urinary symptoms; abnormalities may reflect inflammatory changes, infection, or contamination via colovesicular fistula formation. Blood cultures should be obtained with any suspicion of sepsis. Additional laboratory testing is helpful in excluding other processes. Standard tests for the evaluation of abdominal pain should be ordered when indicated, including a complete blood count, metabolic panel, liver function tests, and lipase. An elevated serum lipase value should reliably diagnose acute pancreatitis. Typing and crossmatching of blood should be performed in patients with hematochezia or signs of a surgical abdomen. Coagulation tests are indicated for bleeding patients, for those taking anticoagulant medications, and for critically ill patients at risk for disseminated intravascular coagulopathy. A pregnancy test is required for any woman of childbearing age who complains of abdominal pain.

**IMAGING**

Plain radiographs of the chest and abdomen are useful to evaluate for the presence of other processes but do not assist in the diagnosis of diverticular disease. Free air is occasionally present in patients with a perforated diverticulum. Evidence of ileus or obstruction may be seen with complicated disease. Computed tomography (CT) of the abdomen and pelvis is the test of choice for confirming the diagnosis of diverticulitis, assessing its severity and complications, and directing intervention. CT findings for and complications of diverticular disease are listed in Box 35.2.

Contrast enema studies are less expensive than CT and are better able to evaluate the lumen of the colon. They are generally performed with water-soluble agents rather than barium given the high likelihood of perforation in patients with diverticulitis.
diverticulitis. Contrast enema studies provide little information, however, about complications of diverticular disease.

Compression ultrasonography is a relatively new diagnostic procedure for diverticular disease. Ultrasonography may be used to serially assess fluid collections or to assist in the transrectal or transvaginal drainage of abscesses. The “pseudokidney” sign (thickening of the bowel wall that mimics the appearance of a kidney) may represent acute diverticulitis and aid in rapid diagnosis by ultrasound. This finding, however, is not specific to diverticular disease.6

Colonoscopy and flexible sigmoidoscopy have limited roles in evaluating diverticulitis in the acute setting. All patients with diverticulitis should be referred for outpatient colonoscopy when their acute illness has subsided. These modalities allow direct visualization of the colonic lumen and biopsy of any lesions. Colonoscopy remains an important initial diagnostic procedure for patients with acute diverticular bleeding.

**TREATMENT**

The majority of patients with acute, uncomplicated diverticulitis respond to bowel rest and antibiotics (Box 35.3).6 The remaining patients require various levels of intervention ranging from percutaneous drainage of abscesses to laparoscopic or other surgical procedures. The surgical mortality rate ranges from 1% to 5%, depending on comorbid conditions and the severity of disease.

Fluid resuscitation is needed in patients with dehydration, peritonitis, complicated disease, and significant bleeding. Patients with evidence of peritonitis or other disease complications require surgical consultation and admission. Patients with complicated disease should take nothing by mouth. Nasogastric decompression should be used in patients with symptomatic ileus.

Pain medication is necessary in most patients with acute diverticulitis. Narcotic analgesics may slow recovery because they promote constipation; patients should be warned to limit the use of these medicines or use adjunctive bulk laxatives. Patients with significant pain should be admitted to the hospital. Titration of pain medication should begin in the ED as indicated by the patient’s reported pain scale, not based on the timing of examination by the consultant surgeon. Fentanyl is easily titrated in parenteral doses of 25 to 50 mcg, is short acting, and causes minimal histamine release or hemodynamic instability.

**CONSULTATION**

Surgical consultation should be obtained immediately for patients with peritonitis or a vascular catastrophe. Consultants should be notified early in the treatment of elderly or immunocompromised patients, as well as for patients with clear indications of complicated disease. Twenty-five percent of patients with a new diagnosis of diverticulitis have complicated disease and require surgical intervention. Patients with uncomplicated disease may require only follow-up with a surgeon on an outpatient basis. One third of these patients eventually require surgery.6

---

**BOX 35.2 Computed Tomography in Diverticulitis**

CT Features of Acute Diverticulitis*  
Increased soft tissue density with pericolic fat changes (98%)  
Colonic diverticula (84%)  
Bowel wall thickening (70%)  
Soft tissue fluid collections or abscess (35%)

Complications of Diverticulitis Found on CT  
Peritonitis (diffuse inflammatory changes, scattered loculated fluid collections)  
Fistula formation  
Bowel obstruction  
Diverticular disease is indistinguishable from carcinoma of the colon in up to 10% of patients


**BOX 35.3 Treatment: Antibiotics for Diverticulitis**

Antibiotic therapy should be directed against the usual colonic flora, particularly gram-negative rods and anaerobes (especially *Escherichia coli* and *Bacteroides fragilis*). Suitable regimens are as follows:

- Piperacillin-tazobactam  
- Ticarcillin-clavulenate  
- Ampicillin, gentamicin, and metronidazole  
- Imipenem-cilastin or other carbapenems  
- Ampicillin-sulbactam (outpatient)  
- Quinolone and metronidazole (outpatient)  
- Sulfamethoxazole-trimethoprim and metronidazole (outpatient)  
- Cefazolin and metronidazole (outpatient)*

*Clindamycin is an acceptable alternative to metronidazole for the coverage of anaerobes.

---

**Prioritize Actions**

Establish intravenous access for the management of diverticulitis.  
Obtain a pertinent history and perform a physical examination, including rectal and genitourinary examination.  
Consider life-threatening conditions in the differential diagnosis.  
Obtain surgical consultation for any patients with evidence of peritonitis.  
Arrange for radiographic and laboratory analysis.
**COMPLICATIONS**

Intestinal obstruction is a rare complication of diverticular disease and generally arises from the small bowel rather than the large bowel. Obstructions result from chronically diseased bowel and adhesion formation. Recurrent attacks of acute disease can cause strictures and narrowing of the lumen of the colon as well, but subsequent complete obstruction of the large bowel is uncommon.

Overall complications from diverticulosis of the small bowel are unusual when compared with those from disease of the colon. Rarely reported problems include massive gastro-intestinal hemorrhage from an arteriovenous malformation located in the submucosa of a jejunal diverticulum, a diverticulum-induced ileoabdominal fistula, and cases of small bowel obstruction with volvulus.\(^5\)\(^-\)\(^9\)

Duodenal diverticula have been associated with a higher rate of common bile duct stones identified on endoscopic retrograde cholangiopancreatigraphy.\(^10\)\(^,\)\(^11\) This finding may be due to higher rates of bacterial contamination in the biliary system in patients with small bowel diverticula.\(^15\) Rarely, congenital intraluminal diverticula may lead to recurrent abdominal pain and obstructive symptoms.

Jejunoileal diverticula occur in 1% of the population and may cause malabsorption from chronic bacterial overgrowth. Other symptoms include early satiety, bloating, and chronic upper abdominal discomfort.

Colonic diverticular bleeding is generally manifested as painless hematochezia that is self-limited. The amount can be voluminous, with the blood being maroon or bright red. Because bleeding commonly occurs without other signs of inflammation, the abdominal findings may be unremarkable. Only 5% of patients with diverticular bleeding have massive, hemodynamically significant gastrointestinal hemorrhage. These patients are typically older than 60 years and have comorbid conditions.

Ninety percent of all diverticular fistulas arise from the sigmoid portion of the colon. Classically involved organs are the bladder, vagina, skin, and noncontiguous bowel. Colovesicular fistulas occur more commonly in men than in women because of interposition of the uterus between the colon and bladder; fistulas involving the ureter or fallopian tubes are unusual. Enterovascular fistulas may lead to gas in the mesenteric and hepatic portal veins, and septic thrombophlebitis (pylephlebitis) may occur as well.

**FOLLOW-UP, NEXT STEPS IN CARE, AND PATIENT EDUCATION**

Patients with uncomplicated diverticulitis can be considered for discharge on the basis of hydration status, ability to tolerate oral fluids, pain level, comorbid conditions, immune function, home support, age, reliability of follow-up, and ability to obtain antibiotics and take them as required. Those with high fevers and significant leukocytosis should be admitted because of the potential for bacteremia or undetected complications. Patients with complex underlying medical diseases should undergo a period of inpatient observation if there is any concern that the disease may progress to perforation or sepsis.
REFERENCES