Quarterly radiology case

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A 18-year-old woman presented to the emergency department because of abdominal pain. Three days earlier she had a normal vaginal delivery. She was discharged from the hospital on antibiotics for treatment of postpartum endometritis. Physical examination was consistent with peritonitis. The patient had a low-grade fever and a white blood cell count of $29.7 \times 10^3$/?L. A computed tomography (CT) examination was performed and is shown below (Figures 1-4).

For diagnosis and discussion, see the following page.

DIAGNOSIS: Pseudomembranous colitis.

DISCUSSION

Pseudomembranous colitis (PMC) (or, rarely, pseudomembranous enteritis) is most commonly associated with recent antibiotic administration, which causes a disturbance in the normal bowel flora and superinfection with *Clostridium difficile*. The microorganism is a gram-positive, anaerobic bacillus that can cause enteric illness ranging from mild diarrhea to life-threatening colitis. Less commonly, PMC occurs without antibiotic administration and in these cases is secondary to other clinical entities including bowel ischemia, intestinal obstruction, intestinal surgery, and chemotherapy (1).

Clinically, the vast majority of patients present with diarrhea, colicky abdominal pain, fever, and leukocytosis and usually have a history of recent or current use of antibiotic therapy. PMC may develop several days or up to 6 weeks after antibiotic therapy. Although PMC is frequently associated with clindamycin therapy, the cephalosporins and penicillins probably contribute equally or more to the disease. Peritonitis, shock, and the development of toxic megacolon are now rarely seen; however, mortality rates have been reported as high as 15% (2).

The established methods of diagnosis are endoscopy and stool toxin assay. Sigmoidoscopy does not always reveal the disease, however, and in 25% to 70% of cases shows findings of nonspecific colitis (1). When diagnostic, endoscopy displays characteristic, discrete, 1- to 2-mm yellow plaques, or “pseudomembranes,” with an erythematous base adherent to the mucosal surface. The mucosa between the plaques is often normal, although it may
appear edematous and erythematous (3). In most cases, the disease is seen as pancolitis; however, it may be located solely in the transverse and distal colon, and segmental and right-sided PMC are now well recognized.

*C. difficile* produces 2 toxins, A and B, which are thought to act synergistically in causing disease; the B toxin is routinely assayed in laboratory studies. Testing takes 48 hours, and the sensitivity is approximately 95%.

Other components believed necessary for *C. difficile* to produce colonic disease include a disturbance in the normal bacterial flora of the colon and the presence of *C. difficile* with toxin production. Susceptibility to the disease increases with age.

For patients who have an acute onset of abdominal pain with or without fever and diarrhea, radiologic studies have become important, if not crucial, in evaluating possible intra-abdominal inflammatory and/or infectious processes. CT and ultrasound are especially helpful, and these examinations frequently demonstrate abnormalities that suggest PMC but are not diagnostic. CT most frequently suggests the diagnosis, particularly in cases where endoscopy is normal and plain film radiographic studies are equivocal.

CT findings include marked mural thickening of the bowel, low attenuation of the thickened wall corresponding to mucosal and submucosal edema, nodularity of the large bowel wall, and the “accordion sign,” in which alternating bands of edematous haustral folds are separated by intraluminal contrast material (1). Although these findings may be seen in other colitides, the degree of mucosal and submucosal edema required to produce the accordion appearance is relatively unique to PMC. Nevertheless, more recent studies demonstrate that the “accordion sign” may be related to other causes of colonic edema including ischemia, other infectious agents, inflammatory bowel disease, and cirrhosis. Therefore, this sign should be considered to indicate severe colonic edema of uncertain cause and should be correlated with the clinical and laboratory findings (4).

Ultrasound may be more definitive than CT in determining whether the process is mucosal or submucosal in origin. These 2 layers are markedly thickened in PMC and are of medium heterogeneity. The thickness of the 2 layers correlates well with plaque formation and underlying colonic edema. A thin hypoechoic outer layer corresponding to the muscularis propria is often shown. CT may demonstrate low-attenuation colonic wall thickening without layer separation (1).

On ultrasound examination, ascites is present in 77% of patients with PMC and is secondary to altered colonic wall permeability and hypoalbuminemia. Ultrasound is very sensitive in detecting ascites, and, because bedside examination is possible, it may be an excellent imaging method for patients in the ICU and immediately after surgery.
Classic plain film findings include nodular haustral thickening ("thumbprinting"), ascites, colonic dilatation, and ileus. However, many of these findings are present in other diseases such as Crohn's disease, ulcerative colitis, and other infectious colitides. Barium enema may be used in patients with equivocal clinical and sigmoidoscopic findings and will often demonstrate the findings seen on plain film as well as a shaggy contour of the bowel lumen, which is produced by the pseudomembranes and marked edema. Barium enema is of limited value and is contraindicated in severe disease because of the risk of perforation and mucosal irritation (1).

Once PMC is diagnosed, current antibiotic therapy is discontinued, fluid and electrolyte balance is maintained, and the patient is usually treated with oral metronidazole or oral vancomycin hydrochloride. Adequate concentration of oral medication in the colonic lumen is essential; if the patient is unable to tolerate oral medications, intravenous metronidazole may be used, but intravenous vancomycin is ineffective. Repetition of therapy may be necessary, as relapse can occur in as many as 20% of cases (1).

A moderate amount of morbidity is associated with PMC, and the disease can be life threatening if the diagnosis is delayed. When combined with the clinical and laboratory information, CT and ultrasound are extremely helpful in establishing an early and conclusive diagnosis.

References

Figure 1. Digital radiograph from the CT scan shows nodular haustral thickening (arrows) in the transverse colon.

Figure 2. CT image of the upper abdomen confirms marked haustral thickening (arrows) in the transverse colon.

Figure 3. CT image of the mid abdomen demonstrates marked thickening of the wall of the entire colon (arrows). Mild inflammatory changes are present in the pericolonic fat.

Figure 4. CT image of the pelvis shows marked thickening of the wall of the rectum (arrows).