

Giant sigmoid diverticulum

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A 49-year-old man was seen with an unusual complication of diverticulitis—a giant sigmoid diverticulum. This patient had undergone an extensive workup during a 5-year period, ranging from multiple extensive gastroenterology evaluations and procedures to an eventual psychiatric evaluation to rule out the possibility of a functional cause for his chronic, intermittent abdominal pain. Later, an accurate diagnosis of a giant sigmoid diverticulum resulted in an en bloc resection of the sigmoid colon and cyst. The patient had an uncomplicated recovery with no return of his previous symptoms. The authors review the many proposed causes of the giant sigmoid diverticulum and possible differential diagnoses. Initially, the diagnosis is usually missed as plain roentgenograms, upper and lower gastrointestinal x-ray studies, and computed tomography scans generally show no abnormality. Management methods are also discussed.

(Key words: Diverticulosis coli, giant sigmoid diverticulum)

Diverticulosis coli is a fairly common entity. More than 35% of the population older than 65 years manifests some form of this condition.¹ This report describes a rare and unusual complication of diverticulitis in which a giant sigmoid diverticulum was found. This entity was first described in 1946 by Bonvin and Bonte.² To date, our literature search has found 74 reported cases. Also presented is a review of the many proposed causes and possible differential diagnoses that should be considered when faced with this syndrome.

Report of case

A 49-year-old man was seen with dull epigastric abdominal pain and night sweats that had increased during

the previous 4 to 5 months. He had no associated gastrointestinal (GI) complaints or changes in weight. Before this initial presentation, the patient had undergone an extensive workup for vague abdominal pains of 5 years' duration.

The workup during that time included the following tests: two upper GI film series; multiple evaluations by various surgeons and gastroenterologists; esophagogastroduodenoscopy; endoscopic retrograde cholangiopancreatography; two dimethyl-iminodiacetic acid scans; two abdominal ultrasound scans; an abdominal computed tomography (CT) scan; an intravenous pyelogram; a barium enema; and multiple laboratory evaluations including a complete blood cell (CBC) count and liver function studies with amylase. All test results were within normal limits.

The patient was eventually referred for a psychiatric evaluation to assess and treat his "functional bowel disease." The evaluation was never completed.

Physical examination showed this man to be in moderate distress with abdominal distension and tenderness elicited over the lower left quadrant and epigastric areas. Bowel sounds were present; a rectal examination revealed no abnormality. His vital signs were: blood pressure, 110/90 mm Hg; pulse, 76 beats per minute; respirations, 24/min; and temperature, 103.8°F.

The patient was admitted to the surgical service and given intravenous ampicillin, 1-g bolus every 6 hours, and gentamycin, 1.5 mg/kg initial bolus followed by pharmacokinetic dosing based on peak and troughs.

An abdominal x-ray series was obtained and raised the possibility of a gastric outlet obstruction (*Figure 1*). Laboratory studies disclosed the following values: white blood cell count, 12,200/mm³; hemoglobin level, 15.8 g/dL; hematocrit, 48.8 %; results of liver function studies, amylase, and urinalysis were all within normal limits. An upper GI x-ray film series later showed no communication between a large gas bubble and the stomach or the small bowel, but it did show upward displacement of the stomach and downward displacement of the transverse colon (*Figure 2*). Subsequently, a CT scan of the abdomen revealed a large (14 cm in diameter) cystic mass with a large amount of air and fluid (*Figure 3*).

The patient was taken to the operating room. During surgery, the cystic mass was found to have dense adhesions to the sigmoid colon (*Figure 4*). An en bloc resection of the sigmoid colon and cyst was performed. The patient had a diverting colostomy with a Hartmann's pouch. He had an uncomplicated recovery and was dis-

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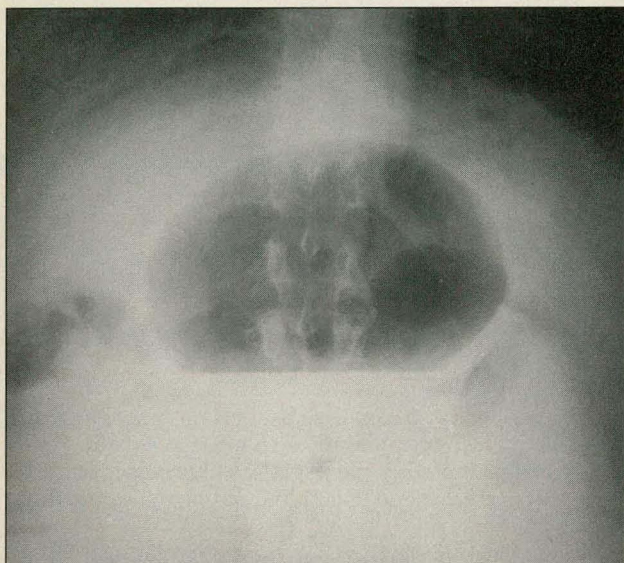


Figure 1. X-ray film of the abdomen showing a large gas collection.

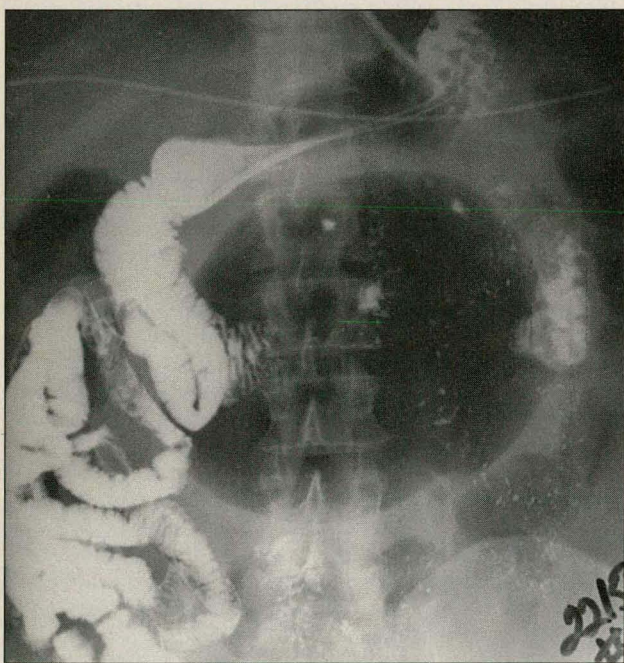


Figure 2. X-ray film from upper gastrointestinal series showing no communication between the stomach or the small bowel with gas collection.

charged 1 week later with no recurrence of his previous abdominal pain. The pathology report described a giant diverticulum of the sigmoid colon with diverticulitis and peritonitis (Figure 5). The tissue sections showed diverticulitis with a diverticular wall of dense fibrotic connective tissue with inflammation within the wall. No sign of malignancy was present (Figures 6 and 7).

Discussion

This rare entity has been given various names

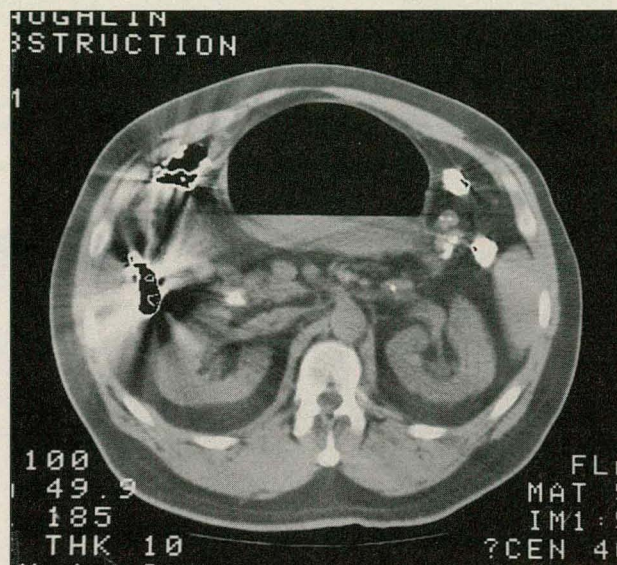


Figure 3. Computed tomography scan of abdomen demonstrating large cystic mass with fluid level visible.

throughout the literature—"intestinal gas cyst," "solitary air cyst," "pneumatocyst of the colon," and "giant sigmoid diverticulum" (GSD).³ The occurrence of a GSD is rare but it has been well described in the literature. The symptoms may range from being an incidental asymptomatic finding to that of perforation or torsion with peritonitis. There also have been reported cases of adenocarcinoma within the lumen of the diverticulum.⁴

The GSD can be of a fixed or variable size when associated with defecation.⁵ The largest cyst recorded measured 29 cm at its greatest diameter.⁶ The incidence of the condition is equal in both sexes.⁵ Giant sigmoid diverticula are predominantly found in the sigmoid colon, but they have been reported to occur in the transverse colon and also as tandem giant diverticula.⁷

The GSD can present itself in numerous ways. Cases of an asymptomatic, incidental finding of a 15-cm diverticulum have been reported.⁸ Giant sigmoid diverticula are usually seen in one of two ways. The first type of presentation—the type described here—is characterized by a long, protracted history of recurrent generalized colicky abdominal pain with bloating. The diagnosis is usually missed, as multiple workups with plain radiographs, upper and lower GI x-ray studies, and CT scans all can fail to show any abnormality. These periods of recurrent symptoms may represent spontaneous decompression of the diverticulum, which is characteristic of its usual protracted course. When the abdominal examination is performed with the cyst present, a nontender soft mass may be palpated. Frequently, the abdomen is tympanic.⁹ The findings of the remainder of the physical examination are usually unremarkable.



Figure 4. Intra-abdominal cystic structure with dense adhesions to sigmoid colon and omentum.

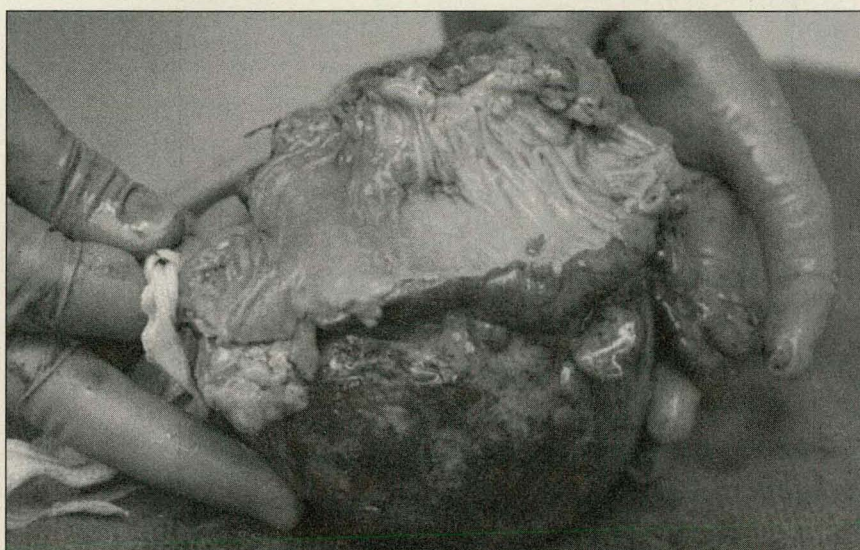


Figure 5. Gross pathologic specimen with sigmoid colon opened. Note diverticular opening to diverticulum within bowel lumen.

The patient may have other nonassociated symptoms relating to chronic medical problems characteristic of the older-aged population. The patient is commonly categorized as having a functional problem, as no pathologic condition can be identified. Only after continued investigation might the classic cystic radiolucency be seen and the patient undergo an appropriate workup.

The second mode of presentation is the result of a complication of the large diverticulum. Patients with this presentation commonly have a history consistent with the first type of presentation, but with one of the various complications listed in *Table 1*. These complications represent a minority of recorded cases. Most cases follow the first-described pattern of intermittent colicky pain with abdominal distension.

The finding of a large, well-circumscribed collection of gas—usually in the midabdominal to

lower abdominal region—offers a perplexing differential diagnosis. *Table 2* lists conditions to consider when this finding is encountered.

In the workup of a patient with a GSD, various radiographic modalities can be used. The plain abdominal film may identify a large radiolucency that may remain fixed or may vary in size (*Figure 2*).⁵ This large radiolucency may have a calcified rim within its wall, as reported by Fields and colleagues.¹⁰

A CT scan is frequently used in helping to make the diagnosis. The CT scan will show a cystic structure that may be air- or fluid-filled. The scan will also determine the location of the structure in relation to adjacent structures (*Figure 3*).

Frequently, an upper GI x-ray film series is performed and may show effacement of the bowel; otherwise, it is noncontributory (*Figure 2*). The lower GI x-ray film series, when used, may be

helpful because 60% of the cases will delineate a communication between the GSD and the sigmoid colon. The other 40% commonly fail to show any communication, as the diverticular neck is frequently obliterated.⁶

The consistently recommended method of managing this diverticulum is a one-step en bloc resection of the sigmoid colon and the diverticulum with a primary anastomosis. This approach assumes that no associated complications, such as torsion or perforation, are present. Other methods of management include two-step sigmoid colon and diverticulum resection,^{6,8,11} diverticulectomy,¹² and conservative nonsurgical therapy.¹³ Those patients who have undergone a two-step sigmoid colon resection and the isolated diverticulectomy have had no unusual complications and have recovered without complication.^{6,8,10} Those patients who were managed conservatively were usually brought to surgery for a sigmoid colon resection at a later date because of recurrence of the symptoms associated with a GSD.¹³

The surgical and pathologic findings can be divided into two types. The more frequent finding—seen in 96% of the cases—is consistent with a pseudocyst formation. The cyst is usually found on the antimesenteric border, with a small or completely obliterated neck. Frequently, no communication can be found between the cyst and the lumen of the bowel.¹⁴ The contents of the cyst can include air, fecal debris, pus, or blood.

The tissue examination usually shows dense, thick, fibrous tissue without the epithelial lining and bowel wall layers (*Figure 6*). The tissue is usually moderately infiltrated with inflammatory cells that are consistent with acute diverticulitis. Note that this description is consistent with the findings of a pseudocyst.

The second type of giant sigmoid diverticulum has a frequency of only 4%, is more consistent with a true diverticulum, and may be congenital.¹⁵ Here, the specimen has all three layers of the bowel within its walls and arises from the mesenteric side of the colon. There have been only three reported cases.^{14,15}

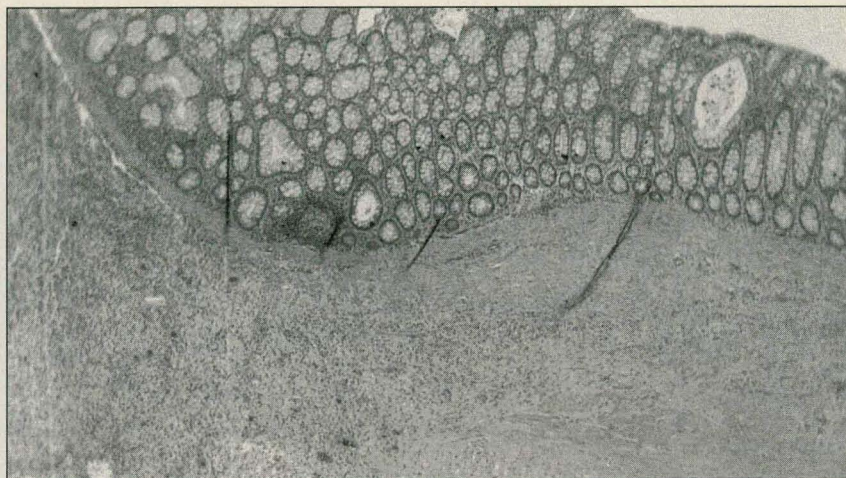


Figure 6. Lining of diverticulum wall with defect in smooth muscle coat (hematoxylin-eosin stain; original magnification $\times 100$).



Figure 7. Wall of diverticulum with ulceration and fistula tract (hematoxylin-eosin stain; original magnification $\times 100$).

The etiology and formation of the GSD have three plausible explanations. The location of these diverticula within the sigmoid colon may be related to the law of Laplace:

$$T = P \times R,$$

where T is the tension in the wall of a hollow cylinder, P is the pressure within the wall of the cylinder, and R is the radius of the cylinder.¹⁶

The sigmoid colon is the narrowest portion of the colon. Because of its localized muscle hypertrophy, there is a marked increase in the intraluminal pressure. This increase, in turn, increases the chance of formation of diverticula and may further increase distension of the diverticulum.

The formation of this GSD may be consistent with one or all of three theories. The “ball-valve” theory describes a mechanism whereby the neck of the diverticulum allows only air and debris to enter. After repeated bouts of diverticulitis, the

Table 1
Complications of the Giant Sigmoid Diverticulum

Complication	Reference
Small bowel obstruction	Ona et al ¹¹
Perforations with peritonitis	Sutorius and Bossert ¹⁰
Abscess	Maresca et al ²
Adenocarcinoma	Saha and Roesch ³
Torsion with infarction	Siberman and Thorner ¹⁷

Table 2
Differential Diagnosis With Findings of a Large, Well-Circumscribed Gas Collection

☐ Cholecystoenteric fistula
☐ Emphysematous gallbladder
☐ Large Meckel's diverticulum
☐ Giant jejunal or ileal diverticulum
☐ Small bowel duplication
☐ Pneumatosis cystoides intestinalis
☐ Vesicoenteric fistula
☐ Emphysemaous cystitis
☐ Pancreatic pseudocyst (infected)
☐ Volvulus of the colon
☐ Colonic duplication
☐ Intra-abdominal abscess
☐ Giant sigmoid diverticulum

neck narrows with fibrosis that may obliterate itself, resulting in a GSD.

A second theory suggests that gas-forming organisms become trapped within the lumen of the diverticulum and begin to ferment its contents. As gas accumulates, the diverticulum will distend to the characteristic proportions of a GSD. The third theory describes a wide-mouth diverticulum without obliteration of the neck. Increases in the intraluminal pressure of the colon secondary to any Valsalva's maneuver will increase the pres-

sure within the diverticulum, thereby increasing the size of the diverticulum. Variability in the pressure may vary the size of the diverticulum.

Comment

Although diverticulosis and diverticulitis are common entities in the older population, the GSD is a fairly rare complication. Once this entity has been recognized by various radiographic means, the involved portion of the sigmoid colon and the diverticulum can be safely resected en bloc in either a one- or two-stage procedure, depending on whether peritonitis is present. If managed by this method, these GSDs rarely have complications and produce minimal mortality and morbidity.

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