

# Giant Sigmoid Diverticulum: Imaging Features and Management

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Diverticular disorders of the colon are common among the aging population of industrial countries. About 50% of individuals older than 60 years of age develop diverticulosis predominantly involving the sigmoid, and 10-20% of them will experience complications during their lifetime, such as diverticulitis, hemorrhage, perforation and fistula to the adjacent organs.<sup>1,2</sup> However, a giant sigmoid diverticulum (GSD) is a rare complication and may present a diagnostic and therapeutic challenge for those who are unfamiliar with the condition.<sup>3-6</sup>

The majority of publications about GSD have been isolated case reports in the surgical literature. This article reviews the imaging and management of GSD.

## Radiographic Findings

Abdominal radiographs reveal the appearance of a GSD as a round or oval, gas-filled structure in middle or left side of the abdomen, usually measuring from 5 to 12 cm in maximal diameter. Colonic examination with contrast enema can demonstrate partial opacification in

most patients (Figures 1, 2). In some instances, however, barium may not enter the GSD on either the colon study or per-oral administration of contrast material. On rare occasions multiple giant sigmoid diverticula may be encountered in the same patient. GSD is associated with comorbid diverticulosis.

## Abdominal Computed Tomography Findings

The initial diagnosis of GSD is often made on computed tomography (CT) of patients with a history of diverticular disease and present with recurrent symptoms. GSD appears as a gas-filled mass with thin walls of about 1 mm, or as a thick-walled cavity containing gas and fluid in some other patients (Figures 2-5). The connection with the colonic lumen may not be visible unless rectal contrast is administered.

## Therapeutic Management

Segmental resection of the sigmoid with the attached GSD is usually performed by open laparotomy or laparoscopic surgery in most patients. The pathological specimens show that the GSD protrudes from the anti-mesenteric aspect of the sigmoid, and most have inflamed and thickened walls associated with

adjacent chronic diverticulitis. Acute diverticulitis is usually treated conservatively rather than by prophylactic sigmoidectomy.

Interventional radiologists treat some patients with GSD via percutaneous drainage, typically under CT guidance. During this procedure, a needle is inserted to suction any fluid content, and then replaced by a pigtail catheter for external bag drainage (Figures 4, 5). Follow-up CT usually shows gradual collapse of the lesion over 4-6 weeks. No recurrence of GSD was detected during 3 years of observation in four cases treated by this technique at our institution.

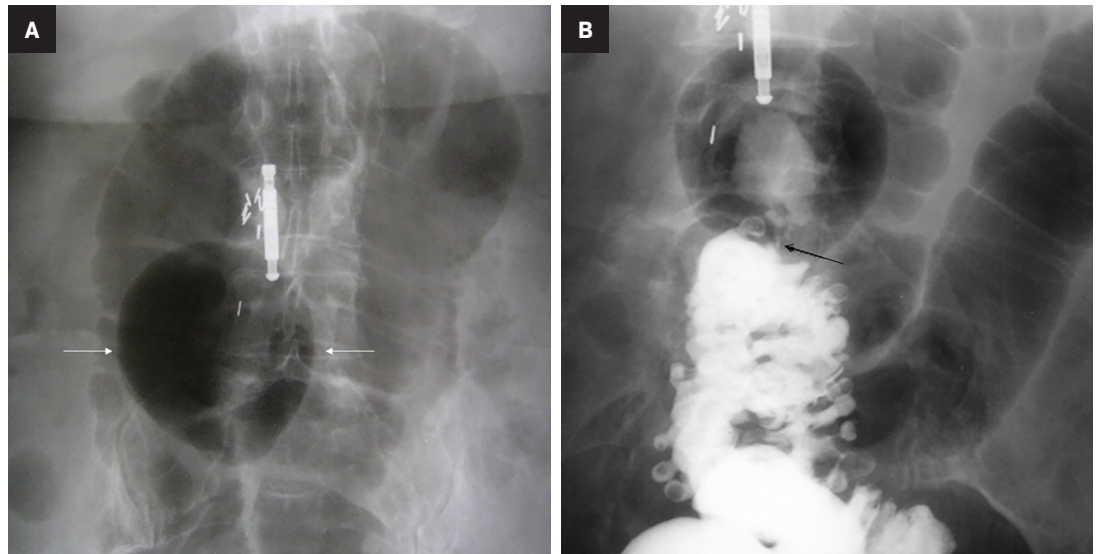
## Radiologic-Pathologic Correlation

Based on the appearance of GSD on imaging studies and pathologic specimens, two patterns can be identified.

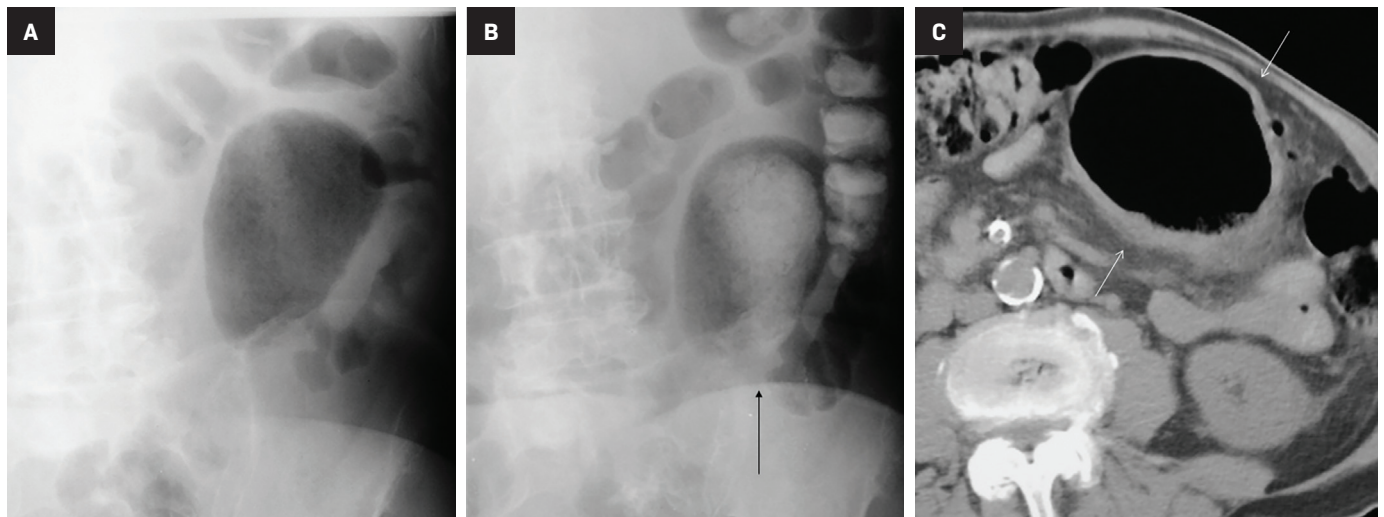
Type 1 includes cases whereby the GSD has thin walls (about 1 mm) on CT, protrudes into the pericolic region beneath the serosal layer, and harbors no inflammatory changes within it or the surrounding tissue. This type results from progressive distention of a pulsion diverticulum, where its narrowed neck serves as a unidirectional valve, thus permitting passage

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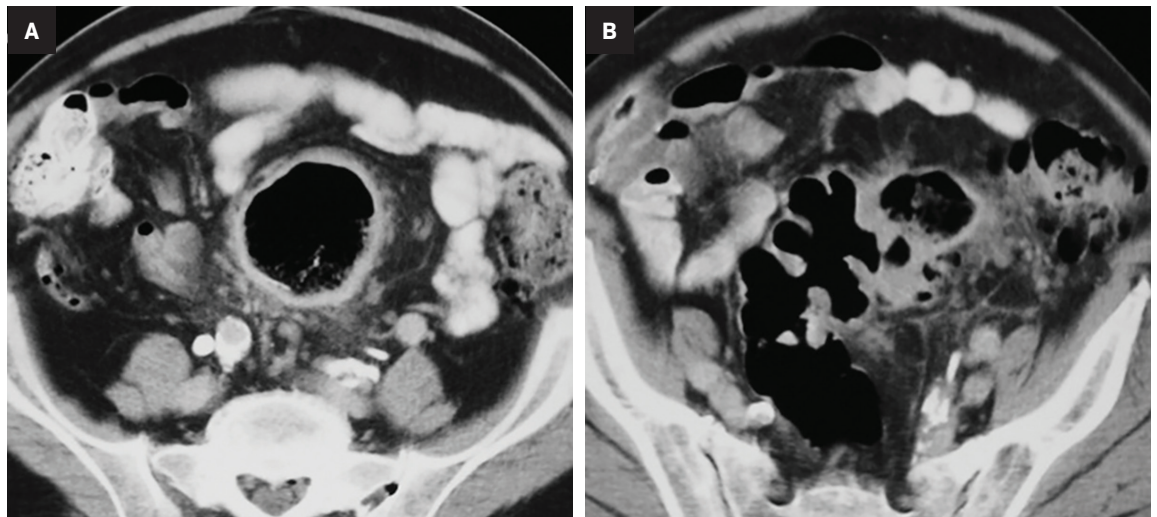
**Figure 1.** Giant sigmoid diverticulum in an elderly adult (with spinal stimulation device). (A) Abdominal radiograph shows a 5 cm round, gas-filled structure in the mid-abdomen (white arrows). (B) Barium enema examination reveals its narrow connection to the sigmoid colon involved by diverticulosis (black arrow).



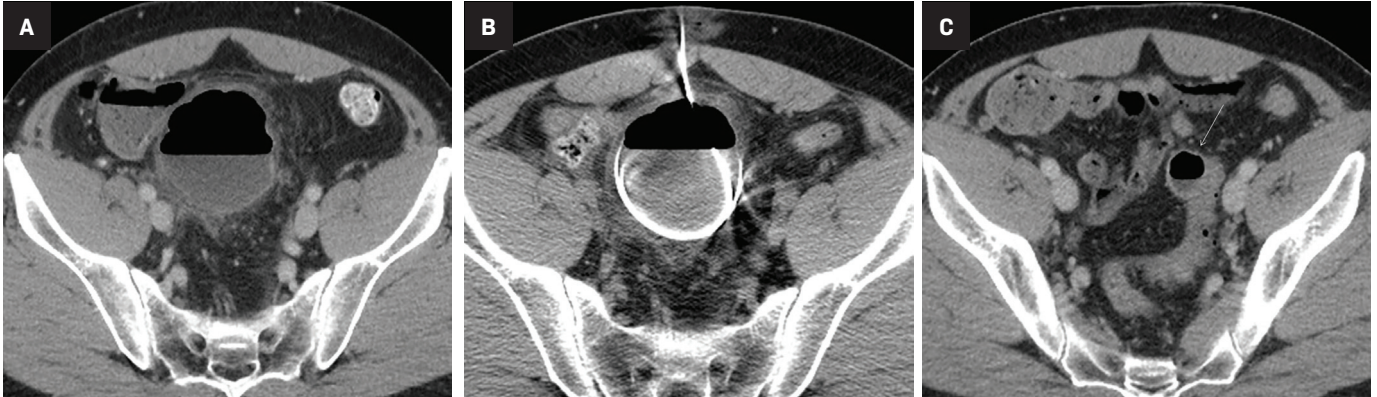
**Figure 2.** Radiological appearance of a GSD in an elderly adult. (A) Abdominal film demonstrates 6 cm, oval-shaped gas collection. (B) Iodinated contrast enema shows partial opacification from its connection to the sigmoid (arrow). (C) CT examination 9 months later reveals slight enlargement of this GSD and thickening of its wall (arrows). This patient underwent laparoscopic resection of the sigmoid colon.



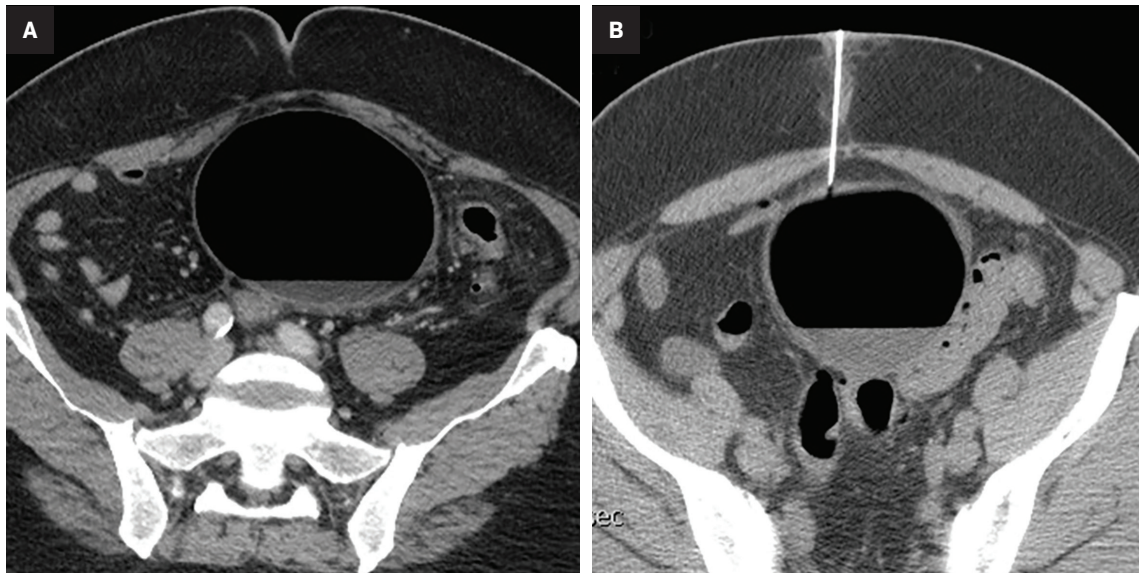
**Figure 3.** (A,B) CT of the abdomen in an elderly adult demonstrates the GSD as a gas-filled cavity with thick walls, associated with sigmoid diverticulitis.



**Figure 4.** Interventional radiologic management of GSD in an adult. (A) CT shows a 6 cm cystic lesion with 2-mm-thick walls, containing gas and fluid. The adjacent mesenteric fat has vascular engorgement and edema due to inflammation. (B) CT-guided placement of a pigtail catheter into the lesion. External drainage led to its gradual collapse. (C) CT performed 2 months later shows reduced size of the GSD to about 2 cm (arrow), which resolved on follow-up studies.



**Figure 5.** (A) CT of the abdomen in a middle-aged adult reveals a 9 cm GSD with very thin walls. (B) CT-guided needle insertion into the lesion prior to placing a pigtail catheter. Drainage of gas and sero-sanguinous fluid reduced the lesion and led to its resolution.



of colonic gas and its entrapment within the diverticular lumen (Figure 6). Such a pulsion diverticulum can result from a focal outpouching of the wall caused by elevated intraluminal pressure. Although the walls of GSD are originally composed of intact colonic mucosa and submucosal layers, they may be later replaced by fibrotic tissue.

Type 2 consists of GSD cases with irregular and thickened walls, associated with inflammation both in the diverticulum and the attached segment of sigmoid colon (Figure 6). The underlying pathogenesis is a perforated diverticulitis, causing a peri-colic abscess cavity with fistulous connection to the bowel

lumen. The development of anaerobic bacterial infection within the abscess likely contributes to the gas-distended appearance of GSD.

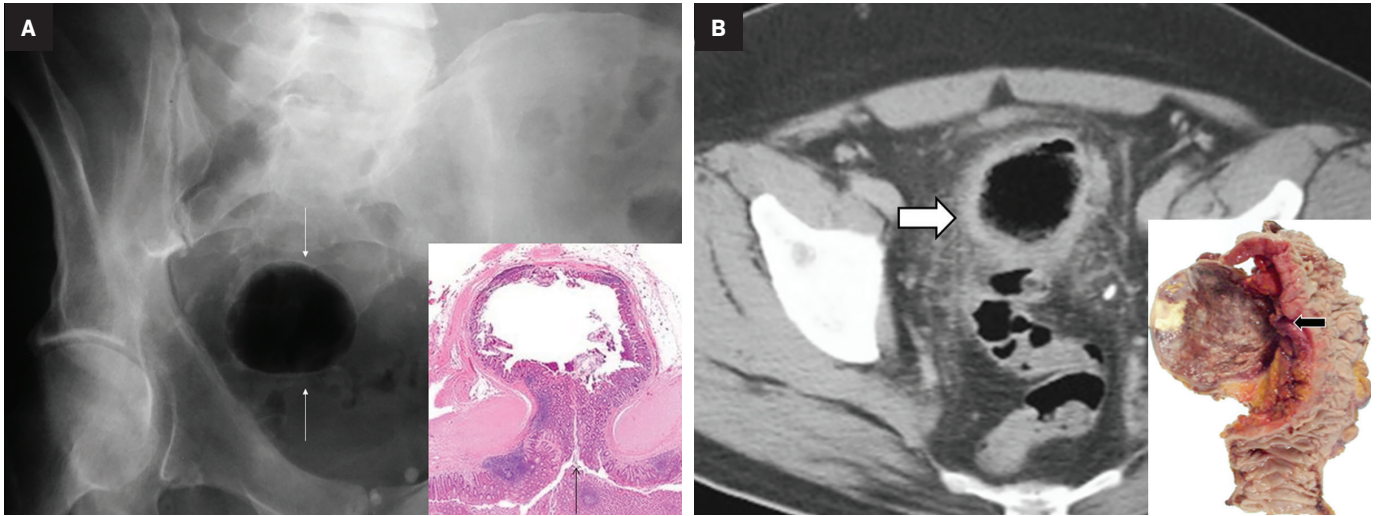
### Clinical Implications

Despite the high incidence of diverticular disease among the aging population of the West, GSD are a rather rare complication.<sup>2-5</sup> This pathologic process was first described in the French medical literature in 1946 by Bonvin and Bonte.<sup>7</sup> Another description appeared 6 years later in an English surgical article.<sup>8</sup> A comprehensive review of the world literature was conducted in 2015 by Nigri, et al.<sup>6</sup>

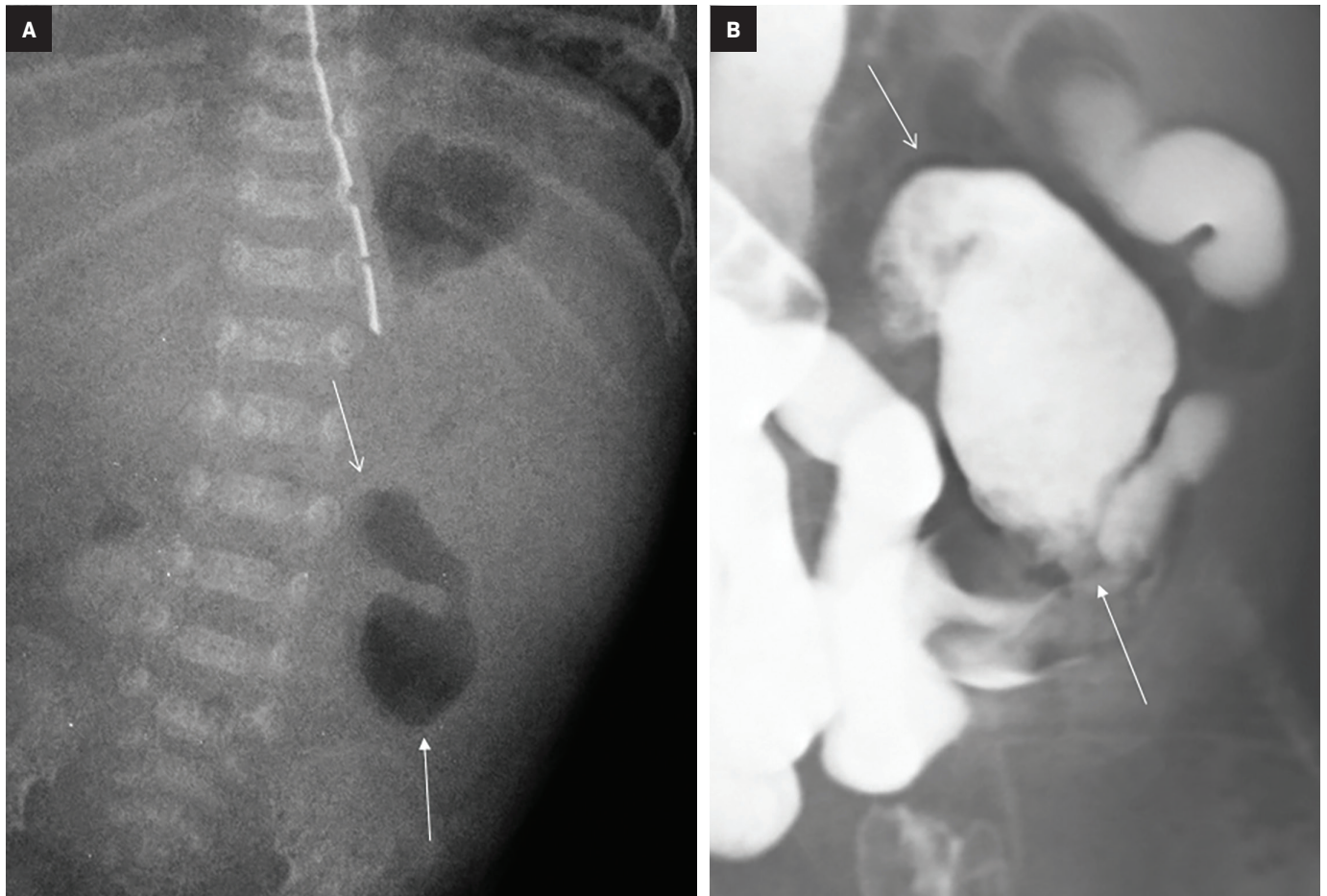
Their investigation revealed a total of 166 cases of GSD in 138 publications, with the majority being isolated case reports or small case series. Our experience from a series of 12 cases will bring that total closer to 180. However, it is likely that the GSD will be recognized more frequently in the future owing to the increasing prevalence of diverticular disorders of the colon affecting adult patients.<sup>1-3</sup>

A giant diverticulum may very seldom occur in other segments of the large bowel, such as the transverse colon.<sup>9-11</sup> Furthermore, some of these giant diverticula have been previously called a “solitary air cyst” or “sigmoid pneumatocoele.”<sup>8, 12, 13</sup>

**Figure 6.** Diagnostic differentiation of GSD types 1 and 2. (A) Radiograph of the pelvis in a middle-aged adult demonstrates a 5 cm type 1 GSD with thin walls (white arrows). Inset: Histologic section of the deflated diverticulum shows its narrow neck (black arrow) and walls lined by colonic mucosa. (B) CT of the pelvic region in a middle-aged adult shows a type 2 GSD with markedly thickened walls (white arrow). Inset: Pathological specimen of the resected sigmoid colon demonstrates the encapsulated mass with a narrow tract to the colonic lumen (black arrow).



**Figure 7.** Radiological presentation of a GSD type 3 in a newborn. (A) Abdominal radiograph shows a saccular gas collection in the left lower abdomen (arrows). (B) Barium enema examination reveals a communicating GSD (arrows) which was surgically confirmed.



Three distinct categories of GSD were classified by McNull, et al:<sup>14</sup>

- Type 1 is formed by a diverticulum with thin walls and a narrow neck that allows its inflation with the colonic gas (Figures 1, 2, 5, 6A).
- Type 2 GSD represents a thick-walled abscess cavity resulting from perforated sigmoid diverticulitis (Figures 3, 4, 6B).
- Type 3 is the manifestation of a congenital anomaly, a communicating duplication cyst with all the colonic wall layers. This particular lesion usually manifests in early childhood<sup>15</sup> (Figure 7). Patients with type 1 GSD may be asymptomatic or have only vague abdominal discomfort. Therefore, the lesion may be detected incidentally during radiological examinations for unrelated abdominal conditions. In some instances, a fluctuant mass may be palpable and enlarge with straining or defecation.<sup>2</sup> This lesion may also deflate intermittently and be considered a phantom tumor.<sup>16, 17</sup> In contrast, type 2 GSD is usually associated with clinical symptoms of diverticulitis; thus, these patients will present with abdominal pain and tenderness, fever, and leukocytosis.

The preferred method of treating a GSD is segmental resection with primary colorectal anastomosis. This may be performed through either open laparotomy or laparoscopy.<sup>4, 6, 18</sup> A simple diverticulectomy is rarely done but may be considered in the absence of concomitant colonic diverticular disease.<sup>6</sup>

Patients with type 1 GSD can be treated by CT-guided interventional drain (Figures 5, 6). This method has become a viable alternative to surgery in recent years, and it may be considered for uncomplicated GSD or in patients who are not good candidates for surgery.<sup>19, 20</sup>

Some authors have recommended that all patients with GSD undergo

prompt treatment to prevent complications such as torsion, volvulus, rupture into the peritoneal space, and malignant transformation.<sup>5, 21</sup>

### Differential Diagnosis

The imaging features of GSD are unique, but other pathological processes should also be considered in the differential diagnosis. These include a gas-containing Meckel diverticulum, intestinal duplication cyst, infected pancreatic pseudocyst, necrotic tumor, and tubo-ovarian or intra-abdominal abscess.<sup>2, 22</sup>

### Conclusion

Giant sigmoid diverticulum is a rare complication of diverticulosis of the colon in adults beyond their fourth decade of life and is a rarely seen congenital finding in children. The lesion may be asymptomatic and incidental on imaging studies. However, most patients present with symptoms of inflammation. Treatment may benefit from a multidisciplinary surgical and interventional radiology approach.

We may expect GSD to be encountered more frequently in the West, owing to an aging population. Therefore, radiologists, surgeons, and gastroenterologists should be familiar with the imaging features of GSD and its management.

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