

BWH emergency radiology—surgical correlation: sigmoid volvulus

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Abstract We describe the radiological and intraoperative correlation of large bowel obstruction due to sigmoid volvulus in a 52-year-old female. The purpose of this article is to emphasize the importance of recognizing sigmoid volvulus as a cause of bowel obstruction in patients presenting with abdominal pain, since it can lead to bowel ischemia and necrosis.

Keywords Sigmoid volvulus · Large bowel obstruction · Multi-detector computed tomography · Surgery

Case presentation

A 52-year-old female with a history of thyroid cancer presented to our Emergency Department (ED) with a 7-day history of abdominal pain and decreased bowel movements. She initially started experiencing dull abdominal pain, which gradually increased in severity and was associated with increasing distention and intermittent nausea. She denied bowel movements for 5 days prior to presentation. She also denied fevers, chills, chest pain, shortness of breath, or sick contacts. Her last colonoscopy 1-year prior reported a redundant sigmoid colon but was otherwise negative. In the ED, her vital signs included a heart rate of 105 beats per minute and blood pressure of 103/71 mmHg. Physical exam revealed an extremely distended and tympanitic abdomen with diffuse tenderness to palpation in both lower quadrants with guarding concerning for focal

peritonitis. Notable laboratory values included a white blood cell count (WBC) of 32,000 cells/mL and lactic acid 3.4 meq/L.

Multi-detector contrast-enhanced computed tomography (MDCT) of the abdomen and pelvis in the coronal plane (Fig. 1a, b) revealed severe dilation of the sigmoid colon, measuring up to 9.1 cm (white stars), with dilation of the proximal colon (white arrows) along with swirling of the adjacent mesentery (black arrow) and surrounding free fluid (black star). These constellations of findings were consistent with a large bowel obstruction due to sigmoid volvulus. There was no evident pneumatosis or free intraperitoneal air.

The patient underwent urgent exploratory laparotomy. Intraoperative findings included a redundant sigmoid colon and massively dilated colon up to the level of the sigmoid volvulus with beaking of the sigmoid at the point of obstruction (Fig. 1c). The redundant and volvulized sigmoid colon was resected, with creation of an end colostomy and Hartmann's pouch. Her postoperative course was uneventful and she was discharged 2 days later. Pathology of the resected sigmoid colon demonstrated severe ischemic colitis and acute serositis corresponding to the dusky appearance of the distal sigmoid colon (Fig. 1d).

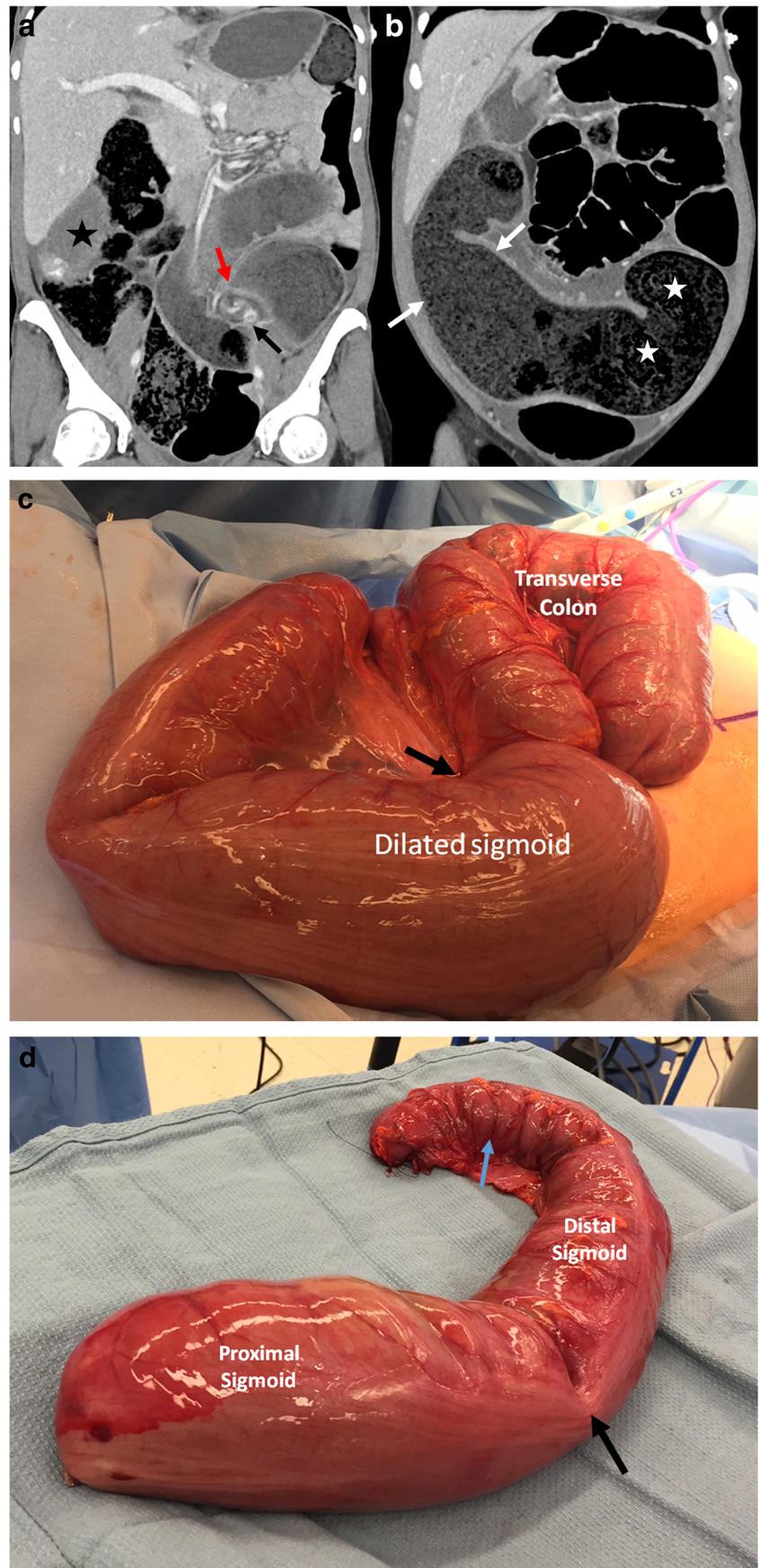
Discussion

Volvulus is defined as torsion of a segment of the gastrointestinal tract leading to bowel obstruction. The most common sites of volvulus are the sigmoid colon and cecum, while stomach, small bowel, splenic flexure, and transverse colon are rare [2]. In the USA, sigmoid volvulus is the underlying etiology in approximately 10 percent of patients presenting with large bowel obstruction [6]. Sigmoid volvulus usually occurs in adults aged 70 years or older, who are debilitated due to underlying neurologic or psychiatric conditions and

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Fig. 1 Multiple contrast-enhanced computed tomography and intraoperative images demonstrating large bowel obstruction due to sigmoid volvulus. CT of the abdomen and pelvis in the coronal plane (**a**, **b**) reveals severe dilation of the sigmoid colon, measuring up to 9.1 cm (*white stars*), with dilation of proximal colon (*white arrows*) along with swirling of the adjacent mesentery (*black arrow*) and surrounding free fluid (*black star*). There is beaking of the sigmoid at the level of the obstruction (*red arrow*). There was no associated pneumatosis or free intraperitoneal air. Intraoperative photographs in an oblique coronal plane (**c**) demonstrate a massively dilated colon up to the level of the sigmoid volvulus with beaking of the sigmoid at the level of the obstruction (*black arrow*). Post-resection intraoperative photograph (**d**) demonstrates devolvulized sigmoid colon (*black arrow* at the point of volvulus) with dusky appearance of distal sigmoid colon (*blue arrow*) corresponding to severe transmural ischemic colitis and acute serositis noted on pathology



have a history of constipation [8]. In younger patients, it is usually seen in association with abnormal colonic motility [9]. The pathogenesis of sigmoid volvulus includes twisting of the air-filled sigmoid colon around its mesentery. Greater than 180 degrees of torsion results in obstruction of the intestinal lumen, while torsion greater than 360 degrees causes impairment of vascular perfusion [11]. Various anatomic risk factors such as a long redundant sigmoid colon causing chronic fecal overloading have been proposed to explain the pathophysiology of sigmoid volvulus, though the precise mechanism is not well understood [5].

The most common symptoms in patients presenting with sigmoid volvulus include gradually progressive abdominal pain, nausea, vomiting, abdominal distention and constipation [10]. The most common physical exam finding is abdominal distention with tenderness to palpation. Fever, tachycardia, hypotension, abdominal guarding, and rigidity, while absent in the early stages, develop in the setting of associated bowel perforation and peritonitis. Diagnosis of sigmoid volvulus is most commonly established by imaging.

The differential diagnosis of sigmoid volvulus includes other causes of distal colonic obstruction such as mass or adhesions, colonic pseudo-obstruction, and toxic megacolon. Abdominal computed tomography (CT) is usually performed to diagnose sigmoid volvulus and exclude other causes of abdominal pain and intestinal obstruction. While less sensitive, abdominal radiographs can be performed in absence of CT availability. On abdominal CT, twisting of the sigmoid colon around its mesentery and vessels produces a “whirl pattern” in the mesentery as well as a “bird-beak” appearance of the afferent and efferent limbs of the dilated sigmoid segment at the point of obstruction [4]. However, typical imaging features are only present in approximately three-fourths of CT scans [7]. The most suggestive findings on abdominal radiographs include a U-shaped distended sigmoid colon occupying the area from the pelvis to the right upper quadrant with absent rectal gas and small bowel air-fluid levels. However, as many of these findings are also seen in the setting of other causes of distal colonic obstruction, colonic pseudo-obstruction, and toxic megacolon, abdominal radiographs can only establish the diagnosis in 60 % of patients with sigmoid volvulus [8]. On radiographs or CT, the presence of linear pneumatosis suggests associated bowel necrosis, while free intraperitoneal air indicated associated bowel perforation. On contrast enema, a bird’s beak configuration where contrast tapers to the point of obstruction is highly suggestive of sigmoid volvulus. Due to the risk of perforation, contrast enema should only be performed when CT is not available and abdominal radiographs are non-diagnostic.

Reduction of the sigmoid volvulus and prevention of recurrence are the treatment goals. Lower endoscopy is

successful in 79 to 95 % of cases in detorsing the volvulus by advancing the sigmoidoscope through the twisted segment of bowel, thus restoring its blood supply [1]. Immediate laparotomy is reserved for cases where endoscopic management is unsuccessful or in cases with an elevated level of clinical concern for peritonitis or perforation. Resection of the necrotic segment with primary anastomosis or Hartmann’s procedure is the surgical management of choice for patients undergoing immediate laparotomy [10]. Mortality ranges from 11 to 60 % in patients with associated gangrenous bowel, and is less than 10 % in patients without gangrene [8]. Up to 60 % of patients who underwent endoscopic reduction experience recurrent sigmoid volvulus, over a time frame varying from hours to months [3].

In conclusion, we have shown radiological and surgical correlation of large bowel obstruction due to sigmoid volvulus in a patient presenting with diffuse abdominal pain. Timely diagnosis is critical to reduce associated morbidity and mortality.

Conflict of interest The authors declare that they have no conflict of interest.

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