

Case Report: Organo-axial Sigmoid Volvulus Mimicking Sigmoid Colon Malignancy

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Authors' Contributions

Huang Juncheng was involved in the conceptualization and creation of the original draft. Jarvis Janwar was involved in the creation of the original draft.

Kenneth Chin Fu Wen and Yeong Kuan Yuen were involved in reviewing and editing of the manuscript.

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ABSTRACT

An 86-year-old man presented with 5 days of constipation and no constitutional symptoms. Despite a history of prior lower abdominal pain and constipation three months earlier, prior imaging and endoscopy revealed no suspicious findings. On admission, abdominal examination showed distension without tenderness, and initial laboratory results were unremarkable. Radiographs demonstrated dilated large bowel loops, while a follow-up CT scan revealed a transition point in the sigmoid colon with gross mural thickening of the sigmoid colon and whirling of the pericolic vessels along the long-axis of the sigmoid colon, leading to a diagnosis of organo-axial sigmoid volvulus. The patient's symptoms resolved spontaneously during admission, and he was discharged after three days of conservative management.

Sigmoid volvulus is the most common colonic volvulus, occurring primarily in immobile, constipated individuals. Organo-axial volvulus, a rarer subtype, involves twisting along the longitudinal axis. Diagnosis is largely radiological, and early intervention is crucial to prevent complications such as bowel ischemia, necrosis, and perforation. While elective surgery is recommended to reduce recurrence and improve outcomes, conservative management may be suitable for frail, high-risk patients. Organo-axial volvulus should be considered in the differential diagnosis of sigmoid colon obstruction, especially when malignancy is suspected.

CASE REPORT

BACKGROUND

This case highlights the importance of recognizing organo-axial sigmoid volvulus, a rare subtype of colonic volvulus, as a potential cause of large bowel obstruction. We aim to contribute to the existing literature by emphasizing the role of imaging in the diagnosis of this rare entity.

CASE REPORT

An 86 year-old elderly gentleman arrived in the emergency department with 5 days of constipation, without any constitutional symptoms. No history of any prior abdominal surgery was

noted. Approximately 3 months prior to the admission, the patient had previously presented with 4 days history of lower abdominal pain, abdominal distension and constipation. Prior oral gastroduodenoscopy, flexible sigmoidoscopy and CT colonography study performed in the previous admission did not reveal any suspicious mass in the colon.

During this admission, physical examination revealed abdominal distension without any tenderness on palpation. His vital signs were within normal limits (temperature of 36.4 degrees Celsius, blood pressure of 134/81, heart rate of 59, respiratory rate of 18). Initial laboratory markers (including

a full blood count, renal panel, liver panel and serum lactate) were unremarkable. Initial radiographs of the abdomen revealed dilated large bowel loops with faecal loading along the colon. A follow-up CT scan of the abdomen and pelvis demonstrated short segment, gross mural thickening of the sigmoid colon, with only one transition point noted in the distal sigmoid colon, and no other transition point along the colon to suggest a closed loop obstruction. This raised an initial suspicion of a possible sigmoid malignancy. However, on closer review, significant whirling of the peri-colonic vessels was seen along the long-axis of the sigmoid colon. Moreover, there was no evidence of any nodal disease or distant lesions to suggest metastasis. In view of these radiological findings, and taking into account the unremarkable findings on the recent CT colonography study just 3 months prior, the patient was diagnosed with an organo-axial volvulus of the sigmoid volvulus. Fortunately, his constipation resolved spontaneously upon the admission, with large amounts of stools passed prior to discharge. The patient was admitted for a total of 3 days. Red flag advice was given and the patient was discharged from follow-up.

DISCUSSION

Etiology & demographics

A volvulus refers to the twisting of the intestine around its blood supply axis. In an organo-axial sigmoid volvulus, the twist happens along the long-axis of the sigmoid colon. This is in contrast to a mesentero-axial sigmoid volvulus, whereby the twist happens along the mesenteric axis of the sigmoid colon, at the base of the sigmoid mesentery. Sigmoid volvulus is the most frequent type of volvulus in the colon, with less common forms including caecal volvulus and transverse colon volvulus. It accounts for 8% of all intestinal obstructions. It typically occurs in patients with limited mobility, who are bedridden or in care facilities, often associated with chronic constipation. A volvulus typically occurs in less mobile individuals with chronic constipation, resulting in a distended and elongated sigmoid colon that twists around a narrow mesentery [1]. It is more frequent in males, with reported male-to-female ratios ranging from 2:1 to 10:1. It generally affects the adult population, with the highest incidence being in the 4th–8th decades of life [2].

Little is known in the literature about organo-axial sigmoid volvulus, compared to mesentero-axial sigmoid volvulus. A study of 38 patients by Toh JWT *et al.* suggests that organo-axial sigmoid volvulus may in fact be as common as mesentero-axial sigmoid volvulus [3], possibly indicating that it is underdiagnosed.

Clinical & imaging findings

Patients with organo-axial sigmoid volvulus can present with abdominal distension on history and physical examination [21]. Other symptoms associated with sigmoid volvulus in general include lower abdominal pain, bloating, constipation, and inability to pass gas, occasionally accompanied by nausea and vomiting [4]. Generally, laboratory findings are not pathognomonic for any type of sigmoid volvulus, as this has

less utility compared to radiologic findings in the diagnostic evaluation [2].

Radiographic findings of organo-axial volvulus typically show marked distension of the large bowel [21], in contrast to a mesentero-axial sigmoid volvulus which demonstrates a “coffee-bean” configuration [5]. In situations where radiographic findings are ambiguous, a contrast enema can serve as a highly sensitive alternative for diagnosis of a sigmoid volvulus, in which a sharp transition point in the sigmoid colon is expected to be demonstrated [5]. In the case of organo-axial sigmoid volvulus, a segment rotates around its longitudinal axis, rather than the mesenteric axis [6]. Only a single transition point is noted, with no evidence of closed loop obstruction [2].

Treatment & prognosis

Early treatment is essential to prevent complications of complications, including bowel ischemia, gangrene, and perforation [7]. Early surgery may be the most effective strategy for patients with recurrent sigmoid volvulus, as it leads to longer survival and improved quality of life [8]. In patients with sigmoid volvulus who do not exhibit peritonitis or bowel necrosis, endoscopic detorsion is the recommended acute treatment, followed by elective surgery due to the high recurrence rates and mortality rates associated with conservative management alone (e.g. high recurrence rate (43–75%) with conservative management and higher mortality rates in conservative treatment (15–40%) compared to surgery (9.1–22.2%)). However, frail patients at high surgical risk may be suitable for conservative management instead. [9]. Spontaneous decompression is rare occurrence in patients with sigmoid volvulus, and this group of patients tend to develop recurrence of sigmoid volvulus [10].

Differential diagnoses

The differential diagnoses for an organo-axial sigmoid volvulus include colorectal malignancy or other non-neoplastic causes of large bowel obstruction, such as colonic pseudo-obstruction, Hirschsprung’s disease, cecal volvulus, ileosigmoid knotting, and giant colonic diverticulum. [11].

Colorectal malignancy may present as luminal narrowing with an “apple core lesion” on abdominal radiographs or computed tomography (CT) [12], or as irregular filling defects, with plaque-like, polypoid or annular/ semiannular lesions on barium enema [13].

Colonic pseudo-obstruction may be demonstrated on abdominal radiographs by a dilated small and/or large bowel, with air present up to the rectum, though the transition points is often at the splenic flexure, rectosigmoid junction, or hepatic flexure. In such cases, a contrast enema is necessary to exclude mechanical intestinal obstruction, as it is the gold standard for diagnosis. CT is also valuable in ruling out mechanical obstruction, especially when a contrast enema is not feasible, and can assess bowel wall thickening, luminal growths, lymph nodes, and other structures such as the retroperitoneum, liver, and spleen [14].

Hirschsprung disease presents with characteristic findings across different imaging modalities. X-rays demonstrate signs of bowel obstruction, where the affected bowel segment appears narrowed, while the proximal bowel is dilated [15]. CT imaging, especially low-dose MDCT, plays a crucial role in diagnosing and assessing Hirschsprung's disease in infants. The use of multiplanar reformations, including sagittal and coronal views, along with thin sections, aids in identifying and measuring the transition zone between the dilated and narrowed bowel [16]. Fluoroscopy-guided contrast enema further enhances visualization of the transition point, with classic diagnostic features such as the "saw-tooth" appearance of the aganglionic segment due to impaired peristaltic waves, and the reversal of the rectosigmoid ratio [17].

Cecal volvulus refers to the axial twisting involving the cecum, terminal ileum and ascending colon. Common radiographic abnormalities include dilated bowels extending from the right lower quadrant to the left upper quadrant of the abdomen, single air-fluid level, small bowel dilation and paucity of gas in the distal colon. On barium enema, "bird's beak" narrowing resulting from bowel tapering at the point of obstruction, is diagnostic for cecal volvulus. Currently, CT is the best modality for diagnosing cecal volvulus. Similarly, the "coffee bean", "whirl" and "bird beak" signs are some CT findings commonly associated with cecal volvulus. Additionally, CT evaluation for complications (such as bowel ischemia or perforation) helps to guide management [18].

Ileosigmoid knotting, also known as compound/double volvulus, occurs when the ileum wraps around the sigmoid, or vice-versa. Abdominal radiograph may show a dilated sigmoid colon with multiple dilated small bowel loops. Barium enema has limited utility in diagnosing ileosigmoid knotting, demonstrating non-specific signs such as bowel obstruction. The diagnosis of ileosigmoid knotting is difficult to make without the use of CT. A key finding on CT is the medial deviation of both the cecum and descending colon with a pointed appearance of their respective medial borders. The "whirl" sign, common to all types of volvulus, can be seen as well [19].

Giant colonic diverticulum (GCD), defined as a diverticulum larger than 4cm, most commonly arises from the sigmoid colon. On abdominal radiographs, GCD presents as smooth-walled, round gas-filled lesions near the sigmoid colon, commonly referred to as the "balloon sign". Lack of haustral folds help differentiate GCD from sigmoid/cecal volvulus. Barium enema is useful to identify the size of the GCD and characteristics of its wall. While communication between the GCD and bowel is demonstrated fluoroscopically in most cases, non-filling of the GCD is possible due to a narrow or inflamed ostium. CT is the best modality to identify and characterise GCDs accurately. Furthermore, administration of intravenous contrast allows differentiation between GCD and colonic perforation with abscess formation as well as assess for local complications [20].

TEACHING POINT

Organo-axial volvulus of the sigmoid can mimic sigmoid colon malignancy and should be considered as a differential for an obstructive lesion in the sigmoid colon.

QUESTIONS

Multiple Choice Questions (MCQs)

1) What is the most common cause of sigmoid volvulus?

- Adhesions
- Inflammatory Bowel Disease
- Chronic constipation (applies)
- Trauma
- Colorectal cancer

Explanation: Chronic constipation is the most common cause of sigmoid volvulus. It leads to prolonged colonic stretching and increased bowel mobility, predisposing the colon to twist around itself. Adhesions typically cause small bowel obstruction, not sigmoid volvulus. Inflammatory bowel disease and trauma are more associated with strictures or injuries rather than volvulus. Colorectal cancer can cause obstructions, but volvulus is not a typical result of cancer.

2) Which of the following imaging findings best describes an organo-axial sigmoid volvulus?

- Single transition point with whirling of peri-colonic vessels (applies)
- Two transition points with whirling of peri-colonic vessels
- Mural hypo-enhancement of the bowel wall
- Gas within the portal venous system
- Gas within the bowel wall indicating ischemia

Explanation: The classic imaging finding of an organo-axial sigmoid volvulus is the presence of a single transition point with whirling of the peri-colonic vessels on CT, often described as the "whirl sign." Mesentero-axial volvulus involves two transition points with vessel twisting. Mural hypo-enhancement of the bowel wall or gas in the portal venous system/ bowel wall suggest advanced ischemia or necrosis (not specific to sigmoid volvulus).

3) What is the initial treatment of choice for a patient with uncomplicated sigmoid volvulus?

- Immediate surgery
- Endoscopic decompression (applies)
- Antibiotics only
- Colonic stenting
- Laxatives

Explanation: Endoscopic decompression (usually via flexible sigmoidoscopy) is the first-line treatment for uncomplicated sigmoid volvulus. It aims to untwist the volvulus and relieve the obstruction. Surgery is reserved for cases with complications like ischemia or failure of endoscopic decompression. Antibiotics are typically adjunctive and not curative. Colonic stenting is not a primary treatment for volvulus, and laxatives alone would not address the underlying obstruction.

4) What is a typical radiological sign on X-ray for a mesentero-axial sigmoid volvulus?

- Tram-track sign
- String of pearls sign
- Coffee bean sign (applies)
- Apple core lesion
- Thumbprinting sign

Explanation: The coffee bean sign is the most characteristic radiological finding for a mesentero-axial sigmoid volvulus on abdominal X-ray. It results from the distended, twisted sigmoid colon. The tram-track sign is seen in chronic lung disease, the string of pearls sign indicates small bowel obstruction, while the apple core lesion suggests colorectal cancer, and thumbprinting is a feature of colitis.

5) Which of the following is a feared complication of untreated sigmoid volvulus?

- Pulmonary embolism
- Bowel perforation (applies)
- Deep vein thrombosis
- Metastasis
- Paraneoplastic syndromes

Explanation: Bowel perforation is the most serious complication of untreated sigmoid volvulus, often leading to peritonitis and sepsis, requiring emergency surgery. Pulmonary embolism, deep vein thrombosis, metastasis or paraneoplastic syndromes are complications related to colonic malignancy instead.

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FIGURES

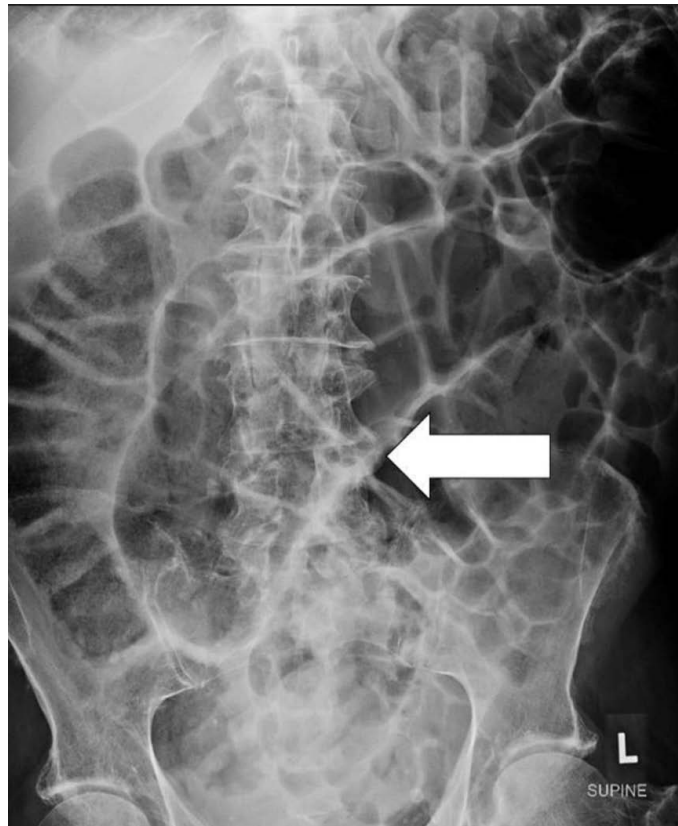


Figure 1: Supine abdominal radiograph demonstrated dilated large bowel loops (arrow).



Figure 2: CT scan of the abdomen and pelvis revealed a single transition point in the sigmoid colon. Axial CT images (Figure 2A.) demonstrated mural thickening of the sigmoid colon (arrow) with whirling of the pericolic vessels (arrowhead). Proximal to the site of obstruction (Figure 2B.), the large bowel was dilated (arrow). Coronal CT images (Figure 2C.) also demonstrated whirling of the pericolic vessels along the long axis of the sigmoid colon (arrowhead). Sagittal CT (Figure 2D.) also demonstrated mural thickening of the sigmoid colon (arrow).

Table 1: Summary Table

Etiology	Organoaxial sigmoid volvulus: Twisting of the sigmoid colon along its long axis Mesenteroaxial sigmoid volvulus: Twisting of the sigmoid colon along the mesenteric axis
Incidence	Sigmoid volvulus is the most common form of colonic volvulus, and accounts for 8% of all intestinal obstructions. Little is known in the literature of the incidence of organo-axial sigmoid volvulus, although a single study had suggested that organo-axial sigmoid volvulus may in fact be as common as mesentero-axial sigmoid volvulus, possibly indicating that it is under-diagnosed.
Gender Ratio	It is more frequent in males, with reported male-to-female ratios ranging from 2:1 to 10:1.
Age Predilection	Generally affects adults, with the highest incidence being in the 4th–8th decades of life
Risk Factors	Chronic constipation, immobility, previous episodes of volvulus.
Treatment	Endoscopic detorsion for acute management; elective surgery recommended to prevent recurrence; conservative management for high-risk surgical patients.
Prognosis	High recurrence rate (43–75%) with conservative management; mortality rates higher in conservative treatment (15–40%) compared to surgery (9.1–22.2%).
Findings on Imaging	X-ray findings for organo-axial sigmoid volvulus: Marked distension of the large bowel. No "coffee bean" sign (in contrast to mesentero-axial sigmoid volvulus). CT findings for organo-axial sigmoid volvulus: Single transition point (organo-axial volvulus) compared to two transition points (mesentero-axial volvulus). Whirling of the peri-colonic vessels along the long axis. Barium enema for organo-axial sigmoid volvulus: Sharp transition point in the rectosigmoid colon

Table 2: Differential diagnosis table for organo-axial volvulus

Condition	X-ray	CT	Fluoroscopy
Organo-axial sigmoid volvulus	Marked distension of the large bowel. No “coffee -bean” configuration.	The sigmoid colon rotates around its longitudinal axis, rather than the mesenteric axis. Only a single transition point is noted, with no evidence of closed loop obstruction. Whirling of the peri-colonic vessels along the long-axis of the sigmoid colon is also seen.	Contrast enema can serve as a highly sensitive alternative for diagnosis of a sigmoid volvulus, in which a sharp transition point in the sigmoid colon is expected to be demonstrated.
Colorectal Malignancy	May show an “apple-core” lesion or large mass. May demonstrate bowel obstruction.	Mass with irregular margins, thickened bowel wall, possible lymphadenopathy or metastasis.	Barium enema may show irregular filling defects, narrowed lumen, and may show plaque-like, polypoid, annular/ semiannular lesions.
Colonic Pseudo-obstruction	Dilated small and/or large bowel, with air up to the rectum; the transition points is often at the splenic flexure, rectosigmoid junction, or hepatic flexure.	Useful to exclude mechanical obstruction. Assesses bowel wall thickening, luminal growths, lymph nodes, and other abdominal organs like the liver and spleen.	Contrast enema is the gold standard to exclude mechanical obstruction; absence of stricture, decreased motility, or haustrations are suggestive.
Hirschsprung’s Disease	Dilation of the proximal colon, distal narrowing.	The use of multiplanar reformations, including sagittal and coronal views, along with thin sections, aids in identifying and measuring the transition zone between the dilated and narrowed bowel.	Barium enema demonstrates a “saw-tooth” appearance of the sigmoid colon.
Cecal Volvulus	Bowel dilation extending from the right lower quadrant to left upper quadrant of the abdomen, single air-fluid level, small bowel dilation, paucity of gas in the distal colon.	Common abnormal CT findings include “coffee bean”, “whirl” and “bird’s beak” signs. CT is useful to assess for complications to guide management. (such as bowel ischemia, perforation)	“Bird’s beak” narrowing on barium enema is diagnostic.
Ileosigmoid Knotting	Dilated sigmoid colon with multiple dilated small bowel loops.	Medial deviation of the cecum and descending colon with a pointed appearance of the medial borders. “Whirl” sign is a feature as well.	Barium enema has limited diagnostic utility.
Giant Colonic Diverticulum (GCD)	Smooth-walled, round gas-filled lesions near the sigmoid colon (“balloon” sign). Lack of haustral folds may help differentiate GCD from sigmoid volvulus.	Best modality to identify and characterise GCD accurately. Intravenous contrast allows differentiation from other differential diagnoses and assess for local complications.	Useful to identify size of GCD and characteristics of its wall. Able to demonstrate communication between GCD and bowel, which is an important feature.

KEYWORDS

Sigmoid volvulus; Organo-axial; Bowel obstruction; Abdominal distension; Abdominal pain

ABBREVIATIONS

X-RAY = RADIOGRAPH

CT = COMPUTED TOMOGRAPHY

GCD = GIANT COLONIC DIVERTICULUM

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