

Case Report

Diagnostic modalities imaging of sigmoid volvulus in adults

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ABSTRACT

In adults, large bowel obstruction is predominantly attributed to colon or rectal cancer, diverticular disease, or colonic volvulus. Obstruction from the colonic volvulus results from twisting a redundant segment of the colon on its mesentery. Volvulus predominantly occurs in the sigmoid colon or cecum in over 95% of cases, with the remainder involving either the transverse colon or splenic flexure. The diagnosis of volvulus is established through clinical evaluation and imaging modalities. Abdominal plain x-rays are usually diagnostic with a coffee bean appearance showing a massive distended sigmoid colon, providing diagnostic clarity in 50% to 75% of cases. Nevertheless, the diagnostic efficacy of abdominal computerized tomography (CT) and magnetic resonance imaging (MRI) is typically claimed to exceed 90%. In CT and MRI, the characteristic finding of sigmoid volvulus is the mesenteric whirl sign, resulting from a rotating sigmoid mesentery, together with a dilated sigmoid colon and air-fluid levels in the small intestine. The diagnostic accuracy of CT and MRI was 97.3% and 95.6% respectively.

Keywords: Sigmoid volvulus, Abdominal plain X-ray, Abdominal computerized tomography

INTRODUCTION

Volvulus occurs when a segment of intestine rotates within itself and the accompanying mesentery, resulting in a bowel obstruction. The mesentery becomes excessively twisted, obstructing blood supply and leading to intestinal ischemia.¹ In adults, the sigmoid colon is the most often impacted segment of the gastrointestinal tract (gut), succeeded by the cecum. The small intestine is more frequently affected in children. Volvulus risk factors include intestinal malrotation, Hirschprung disease, colonic enlargement, pregnancy, prolonged constipation, and abdominal adhesions. In developing countries, the intake of a high-fiber diet results in excessive strain on the sigmoid colon, leading to its twist around the mesentery. Infrequently, appendicitis or surgical procedures may result in significant adhesion that might cause volvulus.^{1,2} The global prevalence of colonic volvulus is inconsistent, with historical data suggesting elevated rates in certain regions of India, Africa, and the Middle East, while the

incidence is comparatively lower in the United States, New Zealand, and Western European nations.¹ While any mobile segment of the colon can twist on itself, the sigmoid colon is implicated in 60-75% cases of colonic volvulus, the cecum in 25-40%, the transverse colon in 1-4%, and the splenic flexure in 1%.^{3,4} Symptoms such as stomach pain, distension, and obstipation should alert the practitioners to the possibility of a sigmoid volvulus, especially in adult and elderly males in endemic regions.^{5,6} Patients report prior experiences of abdominal distention in 30-41% of cases.

This triad is markedly more prevalent in endemic volvulus than in sporadic volvulus. In the volvulus belt nations, the clinical manifestation may be acute, characterized by peritonitis and shock. This acute clinical presentation indicates a bad prognosis, as colonic necrosis and perforation may have already transpired by the time the patient seeks medical attention.^{3,6} The typical symptoms of both sigmoid and caecal volvulus include abdominal

cramps, discomfort, nausea, vomiting, and obstipation. Physical examination often reveals abdominal distension, different degrees of pain, altered bowel sounds, and frequently an empty rectum upon digital examination. The symptom duration prior to presentation varies from a few hours to many days, with acute presentations being more prevalent in cases with sigmoid volvulus.^{7,8}

The diagnosis of volvulus is established through clinical evaluation and imaging modalities. Because sigmoid volvulus presents a complex clinical diagnosis, usually confirmed with imaging modalities. Therefore, radiologists perform an important part in diagnosing sigmoid volvulus, identifying potential complications, and guiding proper management. Imaging should be performed immediately. Chest radiographs are adequate for identifying the presence of free air in occurrences of perforation. The classic finding is that coffee beans appear to extend towards the upper abdomen, occasionally over the transverse colon, which has been described as the northern exposure sign.^{3,9}

Standard abdomen radiographs frequently provide a definitive diagnosis of sigmoid volvulus. The diagnostic evaluation for suspected colon volvulus often starts with plain radiography. In patients with suspected colonic volvulus, plain radiography can be confirmed by CT, which serves as the definitive standard for confirming the diagnosis and identifying complications such as intestinal ischemia and perforation. In instances with ambiguous CT findings, a water-soluble enema (WSE) examination may be beneficial for verification.^{10,11}

The coffee bean sign on the abdomen X-ray indicates the apposition of the medial walls of the distended bowel loops, creating the cleft of the bean, while the lateral wall constitutes the outside contour of the bean, characteristic of sigmoid volvulus. The evaluation of a patient with sigmoid volvulus using abdominal X-ray is effective in forecasting the clinical outcome.^{12,13} When clinical evaluation and standard abdomen radiographs unable to establish the diagnosis of sigmoid volvulus, or if a complication such as imminent ischemia is suspected, immediate CT imaging is indicated. The application of intravenous contrast during CT imaging can enhance the diagnosis of colonic ischemia. Swenson et al, reported a positive diagnostic yield of 89% with CT in cases of sigmoid volvulus. The above modalities can also assess other diagnoses that resemble the appearance of colonic volvulus, including obstruction caused by a tumor or pseudo-obstruction.^{14,15}

Abdominal computed tomography is effective in excluding ischemia or necrosis of the sigmoid colon segment and in ruling out complications such as perforation. Sigmoidoscopy can diagnose sigmoid volvulus by detecting a spiral sphincter-like twist in the lumen, situated roughly 20 to 30 cm from the anal margin. It has significant diagnostic utility, nevertheless, quantitative evidence in the literature is insufficient.⁹ The

addition of a contrast enema may help confirm the diagnosis of sigmoid volvulus by demonstrating a birds-beak sign at the point of colonic torsion. However, an enema is strictly contraindicated when perforation is suspected. When using a contrast enema, a water-soluble contrast is much preferred over barium contrast because the latter could cause a chemical peritonitis in the setting of a perforated colon. Management of sigmoid volvulus: patients devoid of hemodynamic instability, peritonitis, or signs of perforation should generally receive lower endoscopy to evaluate the viability of the sigmoid colon, detach the anatomy, and decompress the colon.

This is successful in 60% to 95% of patients. Endoscopy can reveal the characteristic mucosal pinwheel at the site of obstruction prior to detorsion. Upon successful detorsion of the sigmoid colon, the surgeon may retain a decompression tube to maintain colonic decompression and assist with preoperative mechanical bowel preparation, if required. In instances where endoscopic detorsion of the sigmoid colon is unsuccessful, or in cases with a nonviable perforated colon, we advocate for immediate sigmoid resection. Patients who experience successful endoscopic detorsion should be evaluated for sigmoid colectomy during the same hospital admission to avert recurring volvulus.⁸

CASE REPORT

A 56-year-old male patient arrived at the emergency department with a stomach-pain that had been present for three days. Patient also complains of inability to defecate and fart, flatulence, weakness, nausea-vomiting, and low intake. Patient had a history of surgery, laparotomy in 2022 and appendectomy in 1994. The patient had a history of intestinal tuberculosis, for which he received full-finish treatment for approximately 6 months. The patient denied having another chronic illness or a history of allergies.

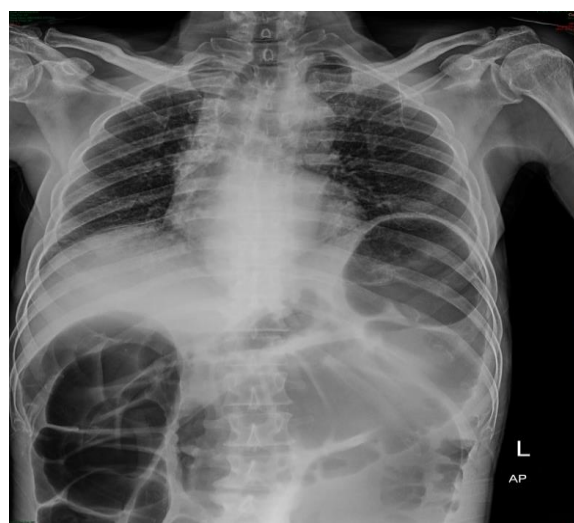


Figure 1: Chest X-ray. Cardio-pulmonary within normal limitation. No presence of free air in occurrences of perforation.

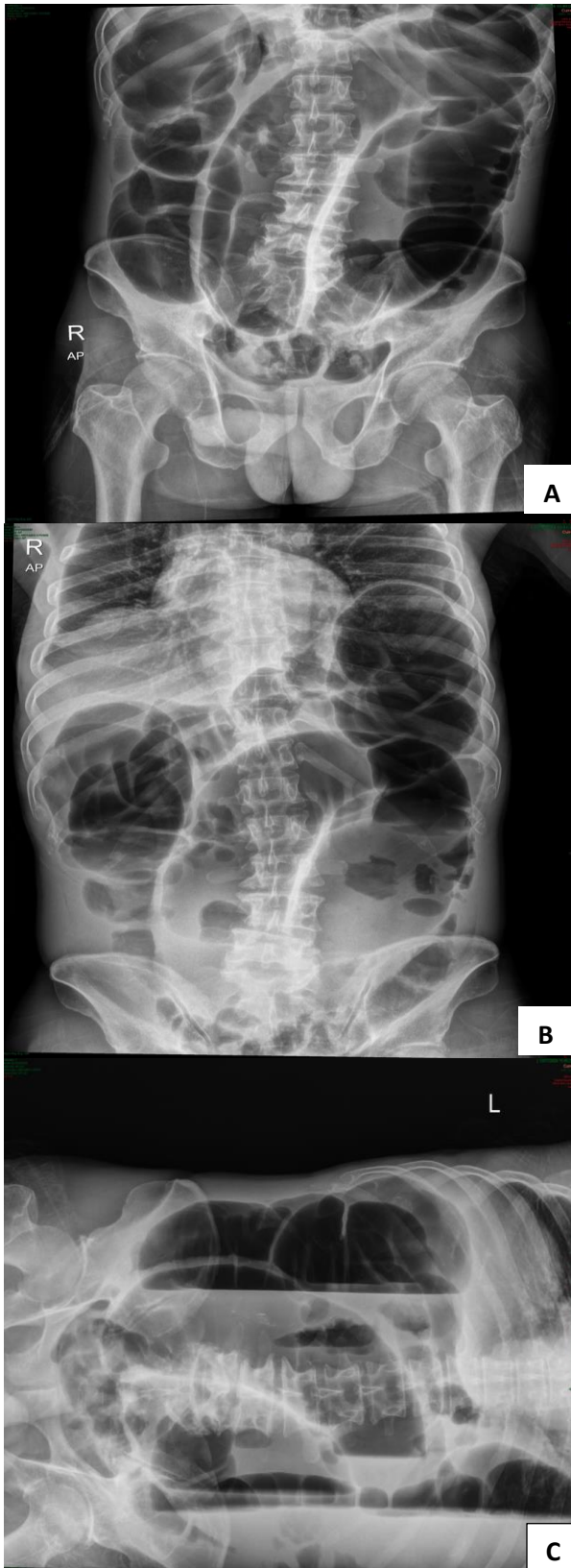


Figure 2: (A-C) Abdominal plain X-ray (3 position): absence of rectal gas with coffee bean shaped dilatation of the sigmoid colon and radio-opaque lines which converge toward the site of obstruction as well as moderate dilatation of the proximal colons. Air fluid level step ladder pattern.



Figure 3: Abdominal CT scan. Whirl sign, twisting of mesenteric vessel.



Figure 4: Sigmoid volvulus, twisting rectosigmoid colon lumen with lumens collapsing in their distal.

The patient was conscious on arrival with Glasgow coma scale (GCS) E4V5M6. The patient's vital signs included a blood pressure of 140/90 mmHg, a pulse rate of 96 times per minute, a respiration rate of 20 times per minute, a temperature of 36°C, an oxygen saturation of 98%, and room air. Physical examination the head is within normal limits, the thorax is within normal limits, the abdomen exhibits tenderness throughout all areas, is distended, the muscles are defanged, the bowel sound is hypertonic. Extremities are within a normal limit.

The patient was treated with intravenous fluid and medication; he took some blood tests, chest X-ray, abdominal plain X-ray, and abdominal CT scan. The results of the blood tests included a complete blood count of 14.65 white blood cells, 5.0 red blood cells,

haemoglobin 15.3, platelet 304, and albumin 4.6, the liver function test showed ALT 67, SLT 28, electrolyte, natrium 141, kalium 3.4, and chloride 110. The general practitioner then consults with the general surgeon, providing advice on fasting, the use of a nasogastric tube, the use of a dower catheter, the use of cefotaxime 3x1 gram, the use of ranitidine 3x150 mg, the use of dulcolax syrup, and the need for an electrolyte correction. The internist was advised to administer IVFD KCL 50 meq 20 drip/minute, along with NaCl 0.9% 12 drip/minute, and to evaluate the electrolyte levels after the correction.

The result of the chest X-ray was cardio-pulmonary within the normal limit. The result of the plain abdominal x-ray was paralytic ileus, spondylosis lumbar vertebrae, and scoliosis lumbar with convexity to the left side and absence of rectal gas with coffee bean shaped dilatation of the sigmoid colon.

Multi-slice CT abdominal findings

The CT scan of the abdomen revealed a significant dilatation of the sigmoid colon and colon in its proximal region. In the transitional zone, twisting appears from the rectosigmoid colon lumen, with lumens collapsing in their distal direction towards the rectum. Additionally, a picture depicting the twisting of the mesenterial arteries with whirl signs is included. No free air is seen outside the intestinal contour.

Liver

Normal size, regular surface with sharp angles, normal parenchymal density, no dilation of intrahepatic bile duct/extrahepatic bile duct and vascular, no nodules/solid masses seen. Multiple cysts are seen in the right and left lobes, the largest measuring 1.4x1.4 cm, which do not enhance with contrast administration.

Gall bladder

Normal size, normal parenchymal density, no calcification/nodules/cysts observed. No dilation of the pancreatic duct observed.

Spleen

Normal size, normal parenchymal density, no nodules/cysts observed.

Right kidney

Normal size, normal parenchymal density, no dilation of the pelvicalyceal system, no stones/mass/cysts observed.

Left kidney

Normal size, normal parenchymal density, no dilation of the pelvicalyceal system, no stones/mass/cysts observed.

Urinary bladder

Normal size, wall not thickened, no mass/stones observed.

Prostate

Normal size, normal parenchymal density, no calcification observed. No para-aortic and pre-sacral nodules observed. Minimal free fluid density in the lower abdominal cavity observed.

Bones

Multiple osteophytes observed on the lumbar vertebrae. Ground-glass opacity observed in the posterior basal segment of the right and left lower lung lobes. Bronchial dilation with a signet ring and tram track line appearance observed in the right and left lower lung lobes.

Conclusion

The patient had a sigmoid volvulus, little free fluid in the lower abdominal cavity, multiple cysts in the right and left liver lobes, pneumonia, bronchiectasis, and lumbar spondylosis. Then the general surgeon planning surgery for release twisting sigmoid colon.

Surgery report

Intra-surgery

Perform a colostomy with general anesthesia. The surgery begins at 15:15 p.m. Insertion nasogastric tube no. 18. Insertion urine catheter no. 16. Insertion rectal tube no. 24. Bleeding +/- 50 cc. Clean the wound with betadine and NaCl 0.9%. Stitch abdomen layer by layer.

Durante-surgery

Found a twisting colon sigmoid. Dilatation of sigmoid colon to caecum. The colon sigmoid is viable, and other hollow organs are also viable. The patient collapses 1/3 of the proximal rectum, and the rectal tube can be palpated from below.

There is grade 4 adhesion in the mesentery sigmoid, colon descendent, and distal ileum. Dilatation partial of ileum. Diverticle jejunum +/- 10 cm away from Treitz, no infection or bleeding

Treatment

Release the twisting colon sigmoid and the intestinal gas smoothly to the distal region. Resection of sigmoid anastomose then sigmoidopexy to the lateral wall of the abdomen.

Performing colotransversestomy sinistra. Clean and wash cavum abdominal. Insertion drains to the cavum retzii

DISCUSSION

In this case, the patient presents with symptoms such as stomach-pain, inability to defecate or fart, flatulence, weakness, nausea-vomiting, and low intake. The patient has a history of laparotomy and appendectomy, with intestinal adhesion as the predominant etiology. When a patient has suspected colon volvulus, plain abdomen radiographs are frequently helpful in the initial diagnostic assessment. As above, imaging should be done as soon as possible after a suspected volvulus because it can quickly result in a diagnosis. The small bowel may also be distended with air-fluid levels and the colon may be decompressed distal to the area of volvulus on plain abdominal radiographs.^{1,14}

In 31% and 51% of patients with sigmoid volvulus, and in 27% and 15% of patients with caecal volvulus, abdominal radiographs were deemed diagnostic or suggestive of diagnosis. When plain abdominal radiographs and clinical evaluation are insufficient to confirm the diagnosis of colon volvulus, contrast enema or CT imaging may be useful.¹⁸ For both caecal and sigmoid volvulus, contrast-enhanced CT imaging is currently the recommended confirmatory diagnostic test due to its non-invasiveness, accessibility, accuracy, and ability to identify incidental pathology that fluoroscopic contrast studies or plain radiographs might miss.¹⁶

Additionally, abdominal CT can help diagnose colonic ischemia and has been shown to be helpful in differentiating between organo-axial caecal volvulus and caecal bascule. CT without rectal contrast had an average positive diagnostic yield of 77% and with contrast 95%.^{17,19} Computed tomography may reveal a “whirl sign” representing the point of torsion in the mesenteric area around which bowel loops and mesenteric vessels are torsed and can aid in the quick diagnosis and surgical intervention.²⁰ In this patient abdominal plain X-ray confirmed with CT with contrast revealed a significant dilatation of the sigmoid colon and colon in its proximal region with twisting of the mesenteric arteries with swirl signs is included, assists the surgeon in diagnose and perform surgery.

CONCLUSION

Anamnesis, physical examination, and imaging modalities can establish a case of volvulus in either children or adults. Various imaging modalities are used to ensure the volvulus diagnosis. The primary diagnostic modality is a plain abdominal X-ray. Plain abdominal imaging can reveal a “coffee bean,” a indication for a twisted intestine or colon. More detail modalities such as abdominal CT scan, explain more expand detail about the twisted colon and evaluate the potential for necrosis or associated consequences. With abdominal CT modalities can aid the surgeon in selecting procedure and assessing the patient's condition before, after, or during treatment, if required. However, the availability of advanced supporting examinations like

abdominal CT scan imaging can present a challenge, as not all hospitals possess these resources. However, at least with plain abdominal imaging would assist the surgeon to determine the therapeutic approach.

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REFERENCES

1. Vogel JD, Feingold DL, Stewart DB, Turner JS, Boutros M, Chun J, et al. Clinical practice guidelines for colon volvulus and acute colonic pseudo-obstruction. *Dis Colon Rectum*. 2016;59(7):589–600.
2. Nahirniak P, Anand S, Cooper W. Volvulus. In: NCBI Bookshelf. India: StatPearls Publishing; 2020. Available from: <https://www.ncbi.nlm.nih.gov>. Accessed on 18 August 2024.
3. Tian BWCA, Vigutto G, Tan E, van Goor H, Bendinelli C, Abu-Zidan F, et al. WSES consensus guidelines on sigmoid volvulus management. *World J Emerg Surg*. 2023;18(1):34.
4. Atamanalp SS, Disci E, Peksoz R, Atamanalp RS, Tatar Atamanalp C. Management of sigmoid volvulus: a literature review. *Ibnosina J Med Biomed Sci*. 2024;16(01):5–9.
5. Sarfaraz M, Hasan SR, Lateef S. Sigmoid volvulus in young patients: A new twist on an old diagnosis. *Intractable Rare Dis Res*. 2017;6(3):219–23.
6. Kajihara Y. Sigmoid volvulus: Coffee bean sign, whirl sign. *Cleve Clin J Med*. 2020;87(2):81–2.
7. Selais A, Salem A, El-Jabri R. Young adult with acute sigmoid volvulus. *Bahrain Med Bull [Internet]*. 2019;41(3):171–3.
8. Saba M, Rosenberg J, Wu G, Hinika G. A case of sigmoid volvulus in an unexpected demographic. *Surg Case Reports*. 2021;7(1):13.
9. Kumar HR, Soma M. Sigmoid volvulus: a narrative review and current management. *Asian J Med Heal*. 2023;21(10):121–7.
10. Choi SY, Kim KH. Recurrent attacks of sigmoid volvulus in a 16-year-old boy: a case report. 2020;26(1):28–32.
11. Toh JWT, Collins GP, Ridley LJ, Chan M, Schofield R. A tale of two twists: mesentero-axial and organo-axial sigmoid volvulus. *J Med Imaging Radiat Oncol*. 2023;67(3):252–9.
12. Nasery MN, Guler E, Houeibib EM. Imaging finding of the sigmoid volvulus, A case report. 2020. Available from: <https://www.eurorad.org>. Accessed on 12 August 2024.
13. Atamanalp SS, Peksoz R, Disci E. Sigmoid Volvulus and Ileosigmoid Knotting: An Update. *Eurasian J Med*. 2023;54(1):91–6.
14. Alavi K, Thorsen AJ, Fang SH, Burgess PL, Trevisani G, Lightner AL, et al. The American society of colon and rectal surgeons clinical practice guidelines for the evaluation and management of

- chronic constipation. *Dis Colon Rectum*. 2024;67(10):1244-57.
15. SF H. Volvulus of sigmoid colon in 68-year-old male: a case report. *Austin J Emerg Crit Care Med*. 2017;4(3):3-5.
 16. Atamanalp SS, Disci E. Sigmoid Volvulus: Diagnostic Modalities and Sigmoid Gangrene. *Eurasian J Med*. 2021;53(2):166-7.
 17. Bettina L, Antunes C. Sigmoid volvulus. in: national library of medicine. Singapore: StatPearls Publishing; 2024. Available at: <https://www.ncbi.nlm.nih.gov>. Accessed on 21 August 2024.
 18. Wortman JR, Dhyani M, Ali SM, Scholz FJ. Pearls and pitfalls in multimodality imaging of colonic volvulus. *Radio Graphics*. 2020;40(4):1039-40.
 19. Kiyaka SM, Sikakulya FK, Masereka R, Okedi XF, Anyama P. Sigmoid volvulus in an adolescent female: A case report. *Int J Surg Case Rep*. 2021;87:106430.
 20. Idzelytė I, Lobinas T, Strakšytė V. The key radiologic features of sigmoid volvulus : a case report with a review of literature. 2020;8(18):48-53.

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