



Small Bowel Volvulus Due to Mesenteric Lymphadenopathy in a COVID-19-Positive Infant: A Case Report

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Abstract

Background: Segmental small bowel volvulus (SBV) is a lesser-known surgical condition that can affect both children and adults. It is characterized by twisting a segment of the small bowel at its mesentery. Delayed diagnosis can lead to detrimental results.

Case Presentation: We present a rare case of SBV with normal intestinal rotation in an infant infected with COVID-19, which presented with bloody diarrhea, anuria, poor feeding, and lethargy. Due to dilated intestinal loops in radiological findings and refractory metabolic acidosis, the patient underwent laparotomy surgery which revealed huge mesenteric lymphadenopathy at the site of volvulus, and there was no sign of accompanying malrotation. Devolvulation was performed. After starting breastfeeding a few days later, the patient was discharged home without any complications. To our knowledge, this is the first report that addresses COVID-19-induced lymphadenopathy as a lead point for volvulus in an infant.

Conclusion: All clinicians should be aware of SBV as a dangerous and rare disease with a variable presentation to provide the best care for their patients. Mesenteric lymphadenopathy and mesenteric defects can cause segmental volvulus.

Keywords: Segmental small bowel volvulus, Lymphadenopathy, COVID-19

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Received: June 10, 2023, Revised: August 29, 2023, Accepted: August 30, 2023, ePublished: November 15, 2025

Introduction

The term volvulus derives from “volvere”, which means “to roll or turn” (1). Small bowel volvulus (SBV), midgut (complete) or segmental, is a surgical condition of the gastrointestinal (GI) tract characterized by twisting small bowel at its mesentery, resulting in mechanical bowel obstruction and ischemia (2). SBV usually occurs in the neonatal period or first few months in which the entire midgut is twisted due to the abnormal rotation of the intestine. The gut protrudes through the umbilical cord between 5 and 10-11 weeks of gestation. The bowel re-enters the abdominal cavity following 270-degree counterclockwise rotation of the gut (3, 4). Midgut volvulus, which is more common in neonates and young infants, is a known complication of malrotation. Nonetheless, segmental SBV could occur with normal intestinal rotation and at any age due to abnormalities in intestine mesentery (5).

Although there is no sufficient evidence regarding the incidence of segmental SBV, several case series indicate that segmental SBV occurs primarily in premature infants and, in most cases, it occurs in the prenatal period (6).

The prognosis of both complete or segmental SBV is poor without emergent surgery and associated with

sepsis, GI perforation, and the risk of GI ischemia which is caused by vascular pedicle torsion (7).

Herein, we present an infant, who was diagnosed with segmental SBV, and her reverse transcriptase-polymerase chain reaction test (RT-PCR) was positive for COVID-19. The patient underwent laparotomy without any complications. This manuscript was prepared following the CARE guidelines (<https://www.care-statement.org>).

Case Presentation

A 9-month-old girl was referred to our hospital as a tertiary center with symptoms of non-bilious vomiting, bloody diarrhea, anuria, poor feeding, and lethargy. She was born through natural vaginal delivery and had normal growth and development. The patient had no previously documented medical conditions, underlying diseases, or previous hospital admission. Her vital signs at the time of admission were heart rate (HR): 180 beats/minute, respiratory rate (RR): 42 breaths/minute, blood pressure: 110/60 mm Hg, temperature (T): 36.7 °C, and oxygen saturation (O_{2sat}) in room air: 97%.

She appeared tachypneic, lethargic, and ill. The physical examination revealed decreased skin turgor and dry mucus membranes. On abdominal examination, the abdomen

was distended without guarding or organomegaly.

Venous blood gas (VBG) test upon arrival represented metabolic acidosis (pH: 7.36, partial pressure of carbon dioxide [PCO₂]: 25.0, mm Hg, HCO₃: 14 mmol/L), and she had leukocytosis and raised C-reactive protein (CRP). The rest of the lab data are provided in Table 1.

Intravenous hydration was started promptly and, in the meantime, an abdominal X-ray was performed in which the intestinal dilation and wall thickening with free fluid in the abdomen were observed (Figure 1). Abdominopelvic sonography was also performed for the patient, revealing a moderate amount of free fluid in the abdominopelvic cavity and the dilation of small bowel loops with a maximum anteroposterior diameter of 22 mm with increased peristalsis. There was no finding in favor of intussusception.

According to radiological findings and a history of rectal bloody discharge, two differential diagnoses were raised, including shigellosis and midgut volvulus.

In stool exam (SE), 4-5 red blood cells and 10-12 white blood cells were detected which ruled out shigellosis. After resuscitation, the VBG analysis was repeated in which there was no difference in the HCO₃ level (pH: 7.38, PCO₂: 25.9, mm Hg, HCO₃: 15.3 mmol/L). With suspicion of midgut volvulus due to refractory vomiting, the patient underwent laparotomy.

The laparotomy was performed via transverse incision. At first look, the dilated ischemic intestines were obvious. A 360-degree clockwise twist was observed at approximately 15 cm after the Treitz ligament to 20 cm of the terminal ileum, inducing ischemia and congestion.

The intestinal mesentery at the site of volvulus had huge lymphadenopathy and there was no sign of accompanying malrotation; the C-loop of the duodenum had normal rotation, and the ligaments of Treitz, cecum, and colon were in normal anatomical places. Devolvulation was performed; after 5 minutes, the colour of the intestinal wall appeared near normal. Hence, there was no need to perform a second-look surgery, thus the abdominal wall was stitched. After the operation, she was transferred to the intensive care unit and remained intubated for 24 hours due to tachypnea. The COVID-19 test was conducted regarding symptoms and tachypnea, which was positive.

The VBG values of 2 hours after operation were within a normal range (pH: 7.36, PCO₂: 34.8 mm Hg, HCO₃: 20.5 mmol/L).

Complete blood count (CBC), Na, K, and VBG were requested after surgery. CBC showed a white cell count of 16.1×10⁹/L, hemoglobin of 10.5 g/dL, platelets of 314×10⁹/L, Na of 141 mmol/L, and K of 3.4 mmol/L.

Breastfeeding was started for the patient two days later, and she was discharged home without any complications and came back to the office for the post-operation visit two weeks later.

Discussion

SBV is an emergent condition in which the intestine twists toward its vascular pedicle. If the bowel distension worsens or the mesentery remains twisted for longer, blood flow to the affected intestine can be compromised, resulting in ischemia and bowel necrosis (8, 9). Intestinal

Table 1. Laboratory Data

Test	Results	Reference Range
White cell count (10 ⁹ /L)	22.2	6-17
Hemoglobin (g/dL)	13.8	12-17
Platelet (10 ⁹ /L)	398	150-450
Na (mmol/L)	138	135-145
K (mmol/L)	5.3	3.5-5
BUN (mg/dL)	14.39	7-21
Cr (mg/dL)	0.8	0.6-1.1
LDH (U/L)	955	140-280
AST (U/L)	58	1-31
ALT (U/L)	43	1-32
PT (s)	13	9.5-12.7
PTT (s)	42	25.7-38.8
INR	1.0	0.9-1.2
ESR (mm/h)	6	≤10
CRP (mg/dL)	55	0-6

Note. Na: Sodium; K: Potassium; BUN: Blood urea nitrogen; Cr: Creatinine; LDH: Lactate dehydrogenase; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; PT: Prothrombin time; PTT: Partial thromboplastin time; INR: International normalized ratio; ESR: Erythrocyte sedimentation rate; CRP: C-reactive protein.



Figure 1. Anterior-posterior Plain Abdominal X-ray Showing Dilated Small Intestinal Loops With Thickened and Inflamed Wall. Note. Intestinal dilation is suggestive of acute obstruction

rotation abnormalities are the main cause of bowel volvulus in which the entire midgut encounters volvulus and ischemia (7).

According to one theory, the pathogenesis of volvulus without malrotation can be attributed to either the narrowing of the small bowel mesentery or the improper fixation of a section of the mesentery to the peritoneal wall (10). Midgut volvulus is the condition that the entire small intestine from the jejunum to the transverse colon is twisted around its mesenteric pedicle and the superior mesenteric vessels (11).

Segmental SBV is a lesser-known condition that can affect anyone at any age, whereas midgut volvulus caused by malrotation is most common in neonates and young infants (12). Volvulus without malrotation can present with various clinical symptoms. Most commonly, it manifests with signs and symptoms of acute abdomen (13). Symptoms include irritability, poor feeding, hematochezia, bilious vomiting, and respiratory distress (14). Our patient presented with bloody diarrhea, anuria, poor feeding, and lethargy. She also had tachycardia (HR: 140 beats/min) and tachypnea (RR: 42 breaths/min).

Our patient could not be considered a midgut volvulus case because only a segment of the intestine (approximately 15 cm after Treitz ligament until 20 cm to terminal ileum) was twisted.

SBV can be categorized as either primary or secondary based on the etiology. Primary SBV occurs in a healthy abdominal cavity with no predisposing factors or anatomical abnormalities. Secondary SBV develops when there are predisposing lesions, which can be congenital or acquired while the most common of which is postoperative adhesion (74%) (9, 15-19).

In our case, mesenteric lymphadenopathy was the reason for segmental SBV; therefore, it can be categorized as secondary SBV.

The most frequent reasons for abdominal lymphadenopathy are acute diarrhea and respiratory tract infection. Primary mesenteric lymphadenopathy is diagnosed in approximately 20% of the children (20).

Multisystem inflammatory syndrome in children (MIS-C) is a condition that impacts children who have contracted the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes COVID-19 (21). The vast majority of patients with MIS-C have early GI symptoms. A study described a spectrum of intestinal diseases associated with MIS-C, characterized by GI symptoms such as abdominal pain, vomiting, and diarrhea, reported in 97% of patients; right lower quadrant mesenteric lymphadenopathy and mesenteric fat stranding were both observed in 71% of participants (22).

A case report introduced small bowel obstruction due to SBV in a MIS-C patient, secondary to anomalous bands. These bands may be acquired following infection or inflammatory conditions such as COVID-19 (23).

Our patient had a history of new-onset diarrhea plus a positive PCR test for COVID-19, which could be the reason for lymphadenopathy.

Laboratory findings in SBV patients could reveal metabolic acidosis with high lactate levels in 99% and 88% of patients, respectively. However, laboratory results are not definitive to identify the presence or absence of bowel ischemia while they may help confirm clinical suspicion (24). A study by Lin et al demonstrated that combined white blood cell levels of >18000 cells/mm³ and CRP levels of >50 mg/L help identify bowel gangrene in children with SBV; therefore, in children with these findings, treatment should initiate promptly (25). Our patient laboratory tests revealed leukocytosis (white blood cells: $22.2 \times 10^9/L$), metabolic acidosis, and a CRP level of 55 mg/dL.

A combination of clinical symptoms, laboratory studies, radiologic evaluations, and management at the right time is crucial. Radiologic examinations are abdominal radiographs and abdominal ultrasound (US). The abdominal radiograph is often not contributory; however, it might sometimes represent a double-bubble sign related to duodenal obstruction, intestinal distention, and intestinal pneumatosis or portal venous gas in severe cases. The US may demonstrate the position of mesenteric vessels, a reversal of which might indicate intestinal malrotation (4, 26). The upper GI contrast study is the gold standard diagnostic test for malrotation, although it should be considered in elective conditions without acute signs (27). In our case, an abdominal X-ray revealed dilated bowel loops with intraabdominal inflammation signs. We performed emergent surgery without further radiological examinations due to refractory acidosis and the deteriorating clinical findings of the patient.

The recommended treatment for malrotation volvulus involves the use of a nasogastric tube and surgical intervention in emergencies. If surgery is required, the procedure is known as the Ladd procedure, which involves several steps, including untwisting the affected area, separating adhesions through Ladd adhesiolysis, expanding the mesentery, and repositioning the intestines so that they are located in a common mesentery position. Additionally, the surgeon will evaluate the viability of the small bowel loops and perform any necessary resection (7). In our case, volvulus was not accompanied by malrotation. After performing detorsion, it appeared that mesenteric lymphadenopathy had caused segmental SBV. After a few minutes, the colour of the intestinal wall changed to normal due to reperfusion. Thus, neither a second-look surgery nor resection was necessary. A second-look procedure is mandatory in patients who have extensive bowel involvement (28).

Conclusion

SBV has variable presentation and high mortality.

Therefore, all clinicians should be aware of this dangerous and rare disease to provide the best care for their patients. Severe sequelae such as bowel necrosis can be avoided with surgical intervention. Except for congenital malrotation, mesenteric lymphadenopathy, and mesenteric defects can cause segmental volvulus.

Acknowledgements

We wish to thank our counselors in the Clinical Research Development Center of Children's Hospital in Bandar Abbas.

Authors' Contribution

Conceptualization: Saeedeh Majidi.

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Competing Interests

The authors declare no conflict of interests.

Consent for Publication

The patient's legal guardian provided written informed consent for the publication of this case report and any accompanying images. A copy of the written consent is accessible for review by the Editor-in-Chief of this journal.

Data Availability Statement

All data generated or analyzed during this study are incorporated within this published article.

Ethical Approval

The research study received approval from the Ethics Committee of Hormozgan University of Medical Sciences with the ethical code IR.HUMS.REC.1401.231. The study aligns with the principles outlined in the Helsinki Declaration.

Funding

The study did not receive any funding.

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