

Perioperative problems in Pediatric Midgut Volvulus: A Rare Case and Literature review

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Submission date: 29-Jun-2022 03:33PM (UTC+0700)

Submission ID: 1864527181

File name: 20220617060554pmNQ22141.pdf (924.78K)

Word count: 2632

Character count: 16012



Perioperative problems in Pediatric Midgut Volvulus: A Rare Case and Literature review

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Abstract

Introduction: Volvulus is a bowel twisted in its pivot and causes obstruction and decreasing blood flow in the intestine mesenteric. The chronic midgut volvulus may result in malnutrition and disruption of nutrition absorption. We report a case of marasmus caused by midgut volvulus.

Case Report: A 4-year-old male came with a bloated stomach for 2 months, with recurrent abdominal pain, nausea, vomiting, and disturbance in defecation. Physical examination revealed tachycardia, tachypnea, dehydration, abdominal distention, and increased bowel sounds with a metallic sound. Laparotomy confirmed a 270° derotation and Ladd band. The patient was given parenteral and oral nutrition postoperatively.

Conclusion: Midgut volvulus has complex perioperative management that requires immediate diagnosis and treatment to prevent malnutrition, ischemia, necrosis of the gut, and further postoperation complications.

Key Words: Malnutrition, Marasmus, Midgut volvulus, Pediatric, Perioperative

DOI Number: 10.14704/nq.2022.20.6.NQ22141

NeuroQuantology 2022; 20(6):1477-1481

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INTRODUCTION

A volvulus is a gut rotated in its pivot. It may occur at any age, usually in children and 1-year-old infants, and cause an obstruction that decreases intestine mesenteric blood flow due to congenital anomaly. Intestinal malrotation usually occurs in infants, and male is higher than females. It was a rare case that could delay diagnosis and remain asymptomatic.^{1,2} Delay diagnosis and happen chronically causes imbalance nutrition, cumulative deficit protein energy, negative impact on growth development, and malabsorption.²

We present a case of marasmus due to midgut volvulus and perioperative care difficulty.

CASE REPORT

A 4-year-old male, 12 kilograms bodyweight, came with a bloated stomach for 2 months, recurrence pain, nausea, vomiting, and history of defecation disturbances and constipation were present in the last 3 weeks. There was no blood or mucous on his stool. The

improvement. He had a usually delivered history, and his birth weight was 3.5 kg, term, no record of asphyxia, and complete immunization history. On examination, his heart rate was 116x/min, respiratory rate 24x/min and temperature 36.5°C. He looked dehydrated with sunken eyes. The abdominal was distention from the physical examination, increasing bowel sound, metallic sound, but no muscular rigidity. Blood examination showed Kalium 1.3 mEq/L and did Naso Gastric Tube decompression.

The laparotomy found a heavy dilated stomach, 270° derotation midgut volvulus, and viable intestinal adhesion. Intensive care is needed postoperatively for hemodynamic evaluation. The patient received parenteral and oral nutrition and albumin correction and was discharged from the hospital on the 10th day after being able to take an oral diet and starting gastric adaptation movements.

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pediatrician treated him but no



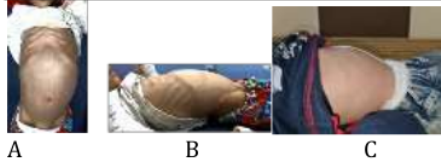


Figure 1. The malnutrition midgut volvulus patient. A, B The patient had severe malnutrition with a dilated abdomen, prominent bones, and low body weight. C On day 20th, the patients had improved oral diet and weight.



Figure 2. The abdominal x-ray. The abdominal x-ray showed a ground-glass appearance and minimal gas on the lower abdomen.



Figure 3. A. Stomach dilatation. B. and C Midgut volvulus along with adhesion. On the laparotomy, found a heavy dilated stomach, 270° derotation midgut volvulus and Ladd band.

CLINICAL PROBLEM

The case above shows a child with marasmus caused by midgut volvulus. The condition is rare and can negatively impact the patient in the short and long term.

Table 1. PICO Analysis

Population (P)	Index (I)	Comparison (C)	Outcome (O)
Pediatric patient with midgut volvulus	Pathophysiology	-	Marasmus

SEARCH METHODS AND RESULTS

We searched the literature from PubMed and Medline using the keywords “midgut volvulus”, “children” and “marasmus”. The search focused on the treatment performed on the patient. The articles included are articles published from 2012 to 2022. Articles or scientific journals that meet the criteria for analysis in this paper are about incidental, symptomatic, complications, and actions against the case illustrations that we present above.

Table 2. Search results

Method of Search	Number of articles found	Relevant articles
Pubmed	28	0
Google Scholar	217	3
Chocran e.	0	0

Destroet *al.* (2020) showed five individuals had related abnormalities, and three had HD. A two-step method with volvulus endoscopic/radiological detorsion followed by intestinal resection was tried in eight patients (one endoscopic approach failed). Three patients needed surgery upon admission. Two patients suffered recurrent intestinal obstruction at follow-up, one of whom also had anastomotic stenosis. The assessment involved detailed histological, immunologic, metabolic, and neurological testing and identification of CIPO. Lifelong follow-up is necessary for the early detection and treatment of progressive disorders impacting the proximal gastrointestinal tract.³

A case report conducted by Haider (2017) concluded sigmoid volvulus is a rare cause of intestinal blockage in infants and teenagers. Pediatric surgeons should maintain a high index of suspicion to avoid missing this essential diagnosis since any delay in treatment may be fatal.⁴Caroet *al.* (2018) made a case report, and they concluded early detection and treatment improve prognosis. The nonsurgical reduction should be stabilized for definitive operation in acute patients.⁵

Table 3. Literature search results

Authors, years	Information	Origin	Methods	Sample	LoE	Result
Destroet, 2021 ³	Management	Italy	Retrospective study	11 patients	IIIa	Five individuals had related abnormalities and three had HD. A two-step method with volvulus endoscopic/radiological detorsion followed by intestinal resection was tried in eight patients (one endoscopic approach failed). Three patients needed surgery upon admission. At follow-up, two patients suffered recurrent intestinal obstruction, one of whom also had anastomotic stenosis. The assessment of the patient should involve a detailed histological examination, immunologic and metabolic screening, neurological testing and identification of chronic intestinal pseudo-obstruction (CIPO). Lifelong follow-up is necessary for the early detection and treatment of progressive disorders impacting the proximal gastrointestinal tract.
Haider, 2017 ⁴	-	Bahrain	Case report	1	IV	Sigmoid volvulus is a rare cause of intestinal blockage in infants and teenagers. Pediatric surgeons should maintain a high index of suspicion to avoid missing this essential diagnosis, since any delay in treatment may be fatal. Early detection and treatment improve prognosis.
Caroet, 2018 ⁵	-	Portugal	Case report	1	IV	The nonsurgical reduction should be sought to stabilize patients for a subsequent definitive operation in patients with acute, nonsurgical presentations.

According to CEBM University of Oxford, JBI's critical assessment checklist, we conducted a critical review. The level of evidence (LoE) was



determined based on the classification issued by the Center for Evidence-Based Medicine University of Oxford in 2011. The search used the entire database on 31 May 2022 at 20:20 WIB with the results attached. The review was conducted with the reviewer (supervisor), and the relevant articles were obtained.

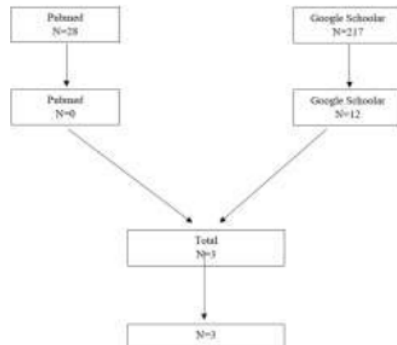


Figure 4. Search result

DISCUSSION

The superior mesenteric artery supplies the intestinal midgut. The bowel was not adequately fixated in malrotation and held by a narrow mesentery. Anomaly or incomplete rotation created various spectrum conditions may be discovered incidentally during radiographic evaluation or shock due to midgut volvulus.²

In neonates, the cardinal sign of midgut volvulus is sudden bile vomiting, intermittent or recurrent vomiting, abdominal distention, bloody feces, fever, intestinal perforation, and metabolic acidosis.⁶ On the physical examinations varied; the abdomen looked scaphoid or enlargement on the upper abdomen. The systemic inflammatory response may include tachycardia, fever, tachypnea, and leukocytosis. In total obstructed bowel, the belly distended progressively, and peritonitis occurred.^{2,7} Patients with chronic obstruction, especially in older children or adolescents, may present non-specific symptoms and problems, including malnutrition, gastroesophageal reflux, feeling full quickly, and mild abdominal discomfort. Symptoms unrelated to abdominal make diagnosis more difficult. Partial volvulus causes mesenteric venous, lymphatic obstruction, and nutrition malabsorption.²

Radiologic imaging is essential in the diagnosis of malrotation. Prenatal fetal ultrasound may reveal prenatal midgut volvulus sequelae, including intestine, abdominal

distention without gas, air-fluid level, intestinal loop dilatation, bowel pneumatosis, or thumbprint sign often observed. The accuracy of conventional radiography in midgut volvulus was low.^{2,7} Upper gastrointestinal is the gold standard for documenting the Treitz ligament on the L1 left spinal position and climbing to the digestive tract outlet. Abnormal rotation found that the low Treitz ligament was not positioned on the left L1 spinal. If volvulus was present, the showed coil spring or corkscrew configuration and beak appearance in the duodenum with complete obstruction.²

In acute volvulus, color doppler ultrasound, the duodenum is dilated with an inverted vein and artery superior-mesenteric (whirlpool sign) and intraperitoneal transverse duodenum. This modality has a sensitivity and specificity of 100% and 98% compared to contrast imaging of the gastrointestinal tract, 40% and 64%, respectively.²⁸

The abdominopelvic Computerized Tomogram (CT) scan shows small intestinal obstruction, closed intestinal loop dilatation, or air-filled. Clockwise rotation and thickening vasa superior mesenteric (whirlpool sign) and bowel ischemia signs can find in midgut volvulus. The bowel ischemia sign (barber pool sign) includes: thickening or air in the intestinal wall, portal vein gas, and free peritoneal fluid are pathognomonic for midgut volvulus. Catheterized angiography showed cessation of mesenteric vessels, lengthened contrast's transit time, no vein turbidity, and distended superior mesenteric vein.⁷

The midgut volvulus patients may experience dehydration and electrolyte imbalance. They need aggressive resuscitation, given broad-spectrum antibiotics, nasogastric decompression, and immediate operation to avoid bowel ischemia.²⁷ Devolvulation (disruption) of the involved bowel is the only maneuver required. Intestinal fixation or resection recommends preventing volvulus recurrency. Resection of atresia segments with primary anastomosis is more procedure than creating a stoma. The significant consequence of the small intestine resection is malabsorption due to reduced absorption surface and digestive enzyme loss.⁹ Ladd procedure includes the release of Ladd's knot and adhesiolysis to prevent recurrency.¹⁰ Laparoscopy is more profitable, shortening postoperative care, decreasing complications⁷, and reducing adhesion than the conventional approach.^{7,10}



Bowel function is usually normalized in 1 – 2 days if using laparoscopy. However, older children with chronic obstruction tend to present with prolonged ileus, and nasogastric drainage and parenteral support are needed. Postoperative antibiotics are not indicated. Feeding may be increased based on the surgeon's evaluation.²¹¹

Postoperative complications may occur with infection, ileus, and specific problem, including short-bowel syndrome, increased mortality, and intestinal transplantation.¹² Total parenteral nutrition (TPN) is critical to maintaining the patient's condition until adaptation and compensatory growth from residual bowel due to bowel dysmotility (pseudo-obstruction).²

In necrotic intestinal need resection and higher risk of the short-bowel syndrome. Intussusception had a higher risk after the open Ladd procedure (3.1%) than laparoscopy (0.05%). The incidence of volvulus recurrence is 1%, and 10% of adhesive postoperative small intestine obstruction needs re-operation.²¹¹ The bowel obstruction was at risk due to adhesion, recurrence, leakage of anastomosis, pelvic abscess, fecal fistula, and colostomy or ileostomy complications.¹²¹³

Total Parenteral Nutrition (TPN) is needed and gradually decreases depending on enteral nutrition (EN) adaptation. The nutritional impact is divided into 3 main categories: direct hyperplasia stimulation through epithelial cell contact; stimulation of the secretion of gastrointestinal trophic hormones; the upper gastrointestinal secretion stimulating production and release of the trophic factor for the small intestine. Specific enteral nutrition is an effective stimulant for trophic factors release. The weaning period from TPN to EN is still controversial. The main advantage of continuous enteral infusion includes enteral food tolerance, better control of calory administration, decreased emesis, small intestine transporter protein, and optimally limited use of the gastrointestinal function. Increased enteral calory was beneficial in additional stimulation for bowel adaptation.⁹ Children with delayed growth preoperatively require routine follow-up to ensure optimal development.¹²

After correctly diagnosed and managed, survival of volvulus and malrotation is high, and more than 80%. The significant morbidity and mortality are because by the loss of the intestine. The increased mortality-related factors are

neonatal, other abnormalities, related comorbidities⁷, and bowel necrosis.¹¹

The mortality surgically for midgut volvulus was 10 – 35% and increased dramatically to 20 – 60% in intestinal gangrene.⁷

CONCLUSION

Midgut volvulus is bowel malrotation requiring immediate diagnosis and therapy to prevent bowel ischemia, necrosis, and further postoperative complications. Perioperative strategies are essential in pre, during, and postoperative.

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