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Intestinal Malrotation with Midgut Volvulus Comorbidity with Bronchopneumonia: A Case Report

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ABSTRACT

Background: Intestinal malrotation is a congenital anomaly resulting from abnormal rotation and fixation of an imperfect midgut during embryonic development. This study aims to describe the diagnosis and management of intestinal malrotation and its comorbid diseases in children. **Case presentation:** A boy, aged 9 months, was referred from a regional hospital with complaints of repeated vomiting accompanied by a distended stomach and no bowel movements for 4 days. Based on the birth history, the patient was born with vacuum assistance for the indication of prolonged phase II. The results of the physical examination showed that the patient was seriously ill, with *compos mentis*, pulse rate 130 x/minute, respiratory rate 34x/minute, blood pressure 90/60 mmHg, temperature 37.6°C, 99% saturation with the help of O₂ nasal canule 2L/minute. There are increased bowel sounds on abdominal examination. Blood examination showed an increase in leukocytes (10.850/mm³). The chest X-ray showed lateral bronchopneumonia, and the abdominal X-ray showed low-lying obstructive ileus. The patient was diagnosed with obstructive ileus due to volvulus, moderate dehydration, comorbid with bronchopneumonia, and global developmental delay. **Conclusion:** Management of intestinal malrotation with volvulus in this patient includes general improvement and rehydration, Ladd's procedure for definitive correction of the cause. Management of comorbid global developmental delay is carried out after the emergency is resolved.

1. Introduction

Intestinal malrotation is a congenital anomaly resulting from abnormal rotation and fixation of an imperfect midgut during embryonic development. The incidence of intestinal malrotation is about 1 in 500 live births. Approximately 75-85% of cases are diagnosed in early infancy, before the age of one year, while the rest are diagnosed during childhood or adulthood. The true incidence of malrotation cannot be estimated in the larger pediatric population because the majority of children do not show any symptoms throughout their lives.¹

The most common cause of postnatal midgut volvulus is intestinal malrotation with total small bowel volvulus.² The presentation of malrotation in infancy may vary from acute, life-threatening ischemic midgut volvulus to non-specific abdominal complaints such as non-specific pain and non-bilious vomiting, and failure to grow.¹ Malrotation with volvulus is an emergency and is treated with the Ladd procedure. Laparoscopic Ladd procedures were performed to reduce the risk of postoperative adhesions and reduce scarring. However, the recurrence rate was high due

to inadequate visualization and technical difficulties.^{3,4} Prenatal diagnosis of this type of malformation is quite difficult in the absence of specific signs. Whirlpool sign is a pathognomonic sign obtained from an ultrasound examination, which shows a visualization of tortuous bowel around the superior mesenteric artery.²

Operative intervention is more difficult in children than during the neonatal period. This is because the band is thicker and rich in fibrous tissue so lymphatic obstruction is often found.⁵ Malrotation in neonates can be triggered by various etiologies. This study aims to describe the diagnosis and management of intestinal malrotation in children.

2. Case Presentation

A boy, aged 9 months, was referred from a regional hospital with complaints of repeated vomiting accompanied by a distended stomach and no bowel movements for 4 days. Based on alloanamnesis, non-projectile vomiting filled with green food and liquid, frequency 10 times/day. The stomach has been bulging since 4 days ago, accompanied by pain, and the child cries when the stomach is touched. There has been no defecation and defecation since 4 days ago. In addition, there was weight loss (from 8 to 7.5 kg), complaints of high fever, and not responding to fever-reducing drugs. The patient was then taken to alternative medicine and massaged the abdomen, but the complaints did not improve. The patient received formula milk from birth until now. Patients get filtered

rice 3 times a day. The day before admission to the hospital, the patient experienced shortness of breath. Shortness of breath is not affected by weather and temperature, no wheezing, or cyanosis.

Based on the birth history, the patient was born with vacuum assistance on the indication of a prolonged phase II postmature pregnancy with a birth weight of 2500 grams. At birth, the patient does not immediately cry. The patient was then admitted to the hospital with a diagnosis of neonatal pneumonia, necrotizing enterocolitis, and sepsis. During treatment, the patient used a breathing apparatus for 7 days and fasted for 14 days. The weight at home was 1900 grams. Current developmental history, the patient is able to clap, wave, and call his parents but cannot sit alone without help.

The results of the physical examination showed that the patient was seriously ill, with *compos mentis*, pulse rate 130 x/minute, respiratory rate 34x/minute, blood pressure 90/60 mmHg, temperature 37.6°C, 99% saturation with the help of O₂ nasal canule 2L/minute. There are increased bowel sounds on abdominal examination. Blood examination showed an increase in leukocytes (10.850/mm³). The chest X-ray showed lateral bronchopneumonia (Figure 1), and the abdominal radiograph showed a low-lying obstructive ileus (Figure 2). The patient was diagnosed with obstructive ileus due to volvulus, moderate dehydration, comorbid with bronchopneumonia, and global developmental delay.



Figure 1. Bilateral bronchopneumonia on chest X-ray.

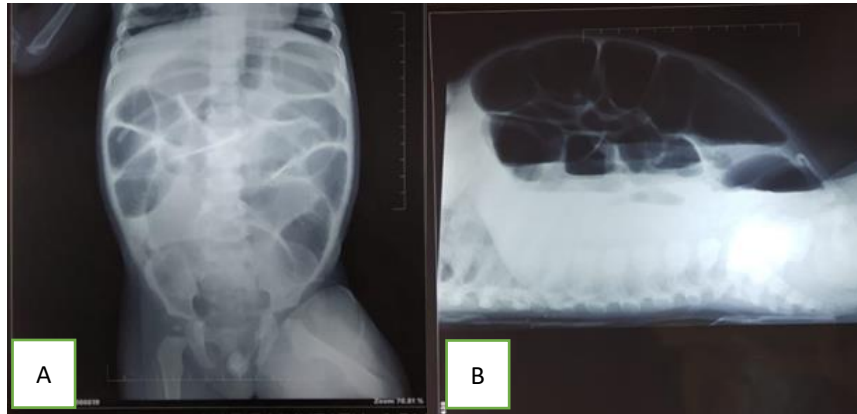


Figure 2. (A-B) Abdominal X-ray 2 positions.

Patient management is divided according to the disorder experienced. The management of moderate dehydration is rehydration with 2A intravenous fluid drops (IVFD) 200 cc/kg BW/24 hours. Management of bronchopneumonia in the form of ceftriaxone 400

mg/12 hours. Obstructive ileus will be treated with exploratory laparotomy after the dehydration is corrected. Observation of fluid balance was carried out for 24 hours. Follow-up of patients during treatment is presented in Table 1.

Table 1. Follow-up of patients during treatment.

| Day to- | Physical examination | Diagnosis | Management |
|---------|--|--|--|
| 2 | No fever; vomit 3 times; there is 400 mL of greenish fluid in a decompressed nasogastric tube (NGT); HR: 92x/min, BP: 90/60 mmHg, RR 28x/min. Fluid balance +610; diuresis 3 mL/kgBW/hour. | Low obstructive ileus, achieved rehydration, bronchopneumonia. | Parenteral nutrition D 12.5%, pediatric aminofusin 5%, ceftriaxone 400 mg/12 hours, paracetamol 80 mg/8 hours prn Preparation for laparotomy surgery. |
| 3 | Exploratory laparotomy. Postoperative vital signs: BP 87/40 mmHg, HR 140x/minute, RR 25x/minute, temperature 35°C. Fluid balance +86, diuresis 3.3 mL/kg BW/hour. | There are adhesions to the ileocaecal valve in 3 places. | Ladd's adhesiolysis procedure (Figure 3) was performed to separate the Ladd's band. The patient was admitted to the PICU after surgery. |
| 4-5 | No fever and shortness of breath. Decreased frequency of vomiting, NGT decompression: 33 mL green fluid. BP 86/46 mmHg, HR 110x/minute, RR 22x/minute, SpO ₂ 98%, afebrile. Fluid balance: -55, diuresis 4.3 mL/kgBW/hour Potassium 2.9 mmol/L | Postoperative Ladd's procedure for malrotation with midgut volvulus. | O ₂ ; Nasal cannula 2 L/min Potassium correction; Ceftriaxone 400 mg/12 hours paracetamol 80 mg/8 hours prn 2 nd day postoperative, start diet 1 tablespoon water. |
| 6-7 | Complaints improve; Defecation 2 times, soft and green consistency. Vital signs: BP 86/50 mmHg, HR: 112x/minute, RR 24x/minute, afebrile. The surgical wound is improving; Fluid balance: +4.8, diuresis 2.1. | Post operation Ladd's procedure on the 3 rd day. | Liquid food diet 10 cc/6 hours, 15 cc/6 hours, the consistency and amount are increased gradually. Ceftriaxone 400 mg/12 hours paracetamol 80 mg/8 hours prn |
| 7-11 | Complaints improving; no mucus and blood on defecation. Vital signs: HR: 110x/minute, RR 28x/minute, afebrile. | Post operation Ladd's procedure on the 3 rd day. Denver II tests show global developmental delay. | Oral cefixime 30 mg/12 hours. The patient was discharged and checked the following week. |

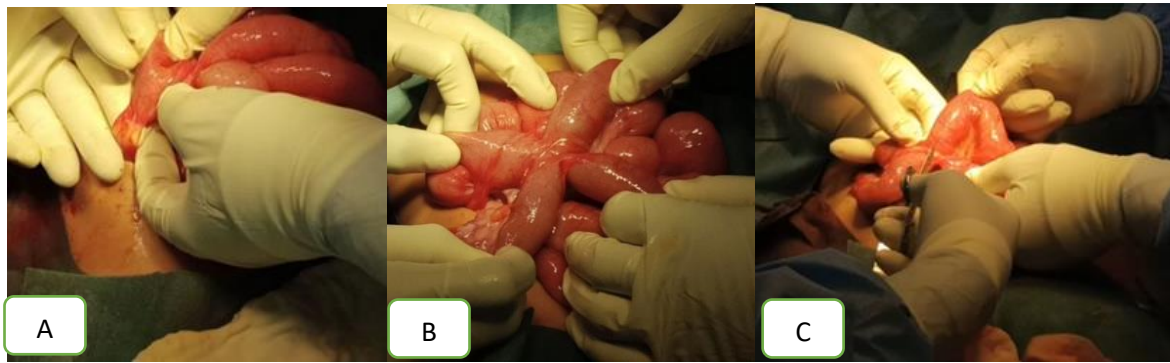


Figure 3. The process of exploratory laparotomy in a patient. A: Ladd's band; B: Ileocaecal adhesions; C: Ladd's band adhesiolysis and separation process.

3. Discussion

The prenatal diagnosis of intestinal volvulus is complex because of the variety of clinical features. Intestinal volvulus is usually associated with malrotation or atresia. Prenatal diagnosis allows appropriate surgical management immediately after birth and improves outcome neonatal.⁶⁻⁸ Prenatal ultrasound signs associated with volvulus include polyhydramnios, dilated and hyperechogenic bowel, whirlpool sign, fetal ascites, peritoneal calcification, meconium peritonitis with stopped, persistent, or intensive bowel peristalsis.⁹⁻¹⁰ Volvulus and atresia often occur together. When volvulus occurs in utero and with ischemic necrosis, secondary intestinal atresia may appear. Primary intestinal atresia may be complicated by volvulus because of increased peristalsis of the dilated bowel, similar to atresia.

Abdominal distension accompanied by bilious can be caused by various etiologies in preterm infants, including necrotizing enterocolitis (NEC), spontaneous/focal intestinal perforation (SIP), septic ileus and malrotation with volvulus. The classic manifestation of malrotation with midgut volvulus in term infants is bilious; however, these symptoms are less well-defined in premature infants.¹¹⁻¹² Imbalance of the healthy microbial ecosystem of the gastrointestinal tract is thought to contribute to the pathogenesis of NEC. In addition, the interaction between milk substrate, microbes, and the immature

host immunological system is considered to be an important point in the initiation of NEC pathogenesis.

As many as 40% of patients with malrotation show clinical manifestations within the first week of life. At 1 month of age, 50-60% are diagnosed successfully, and 75-85% of patients are diagnosed at 1 year of age. The rest were diagnosed after 1 year of age to adulthood. Up to 70% of children with intestinal malrotation have other (congenital) abnormalities, including abdominal wall and digestive system abnormalities, cardiac abnormalities, and liver and spleen abnormalities.¹³

The patient's current medical history consists of greenish vomiting. Malrotation causes the intestine to twist, resulting in intestinal obstruction, and inhibits food from being digested normally due to a lack of absorbed fluids. This obstruction can also lead to dehydration.¹³ Abdominal radiographs are used to assess the appearance of intestinal air due to obstruction, double bubble sign, or masses. If the abdominal X-ray examination found no abnormalities, further evaluation was carried out through the upper gastrointestinal tract (GI).¹⁵

Patients were given aminofucin before surgery. Aminofucin consists of 50 g amino acids, 7.53 g nitrogen, and ± 1750 kJ (400 Kcal) per liter, with an osmolarity ± 800 mOsm/L. Amino acids are the structural units of protein, essential elements for the chemical processes that will sustain life. Proteins have

a structural role (building muscles, organs, glands, ligaments, tendons, nails, hair, and bones) or can be hormones and enzymes that catalyze and regulate most of the vital processes in the body. Amino acids have an important role in the maintenance or restoration of muscle mass in malnourished parenteral patients.¹⁴

The surgical procedure consisted of adhesiolysis and the Ladd procedure for malrotation indications. The Ladd procedure is a surgical procedure that consists of distorting the midgut volvulus, releasing the peritoneal band, verticalizing the duodenum, appendectomy, and restoring the position of the colon to its location on the left abdomen. If the bowel is not necrotic, release the peritoneal bundle that extends from the cecum across the duodenum. This allows the cecum to be mobilized to the left, thereby dilating the mesenteric pedicle to reduce the risk of recurrent volvulus.¹³

In uncomplicated extrinsic obstruction caused by duodenal bands, peristalsis returns in 1 - 5 days. Immediate postoperative care in patients with intestinal malrotation includes fluid resuscitation and observation, administration of broad-spectrum antibiotics, and abdominal decompression using a nasogastric tube. The patient was malnourished in the hospital due to a loss of \pm 600 grams during treatment (7.5 kg before surgery and 6.9 kg after surgery), so the patient became thin. Poor nutritional status at admission or worsening nutritional status during hospitalization is recognized to affect outcomes. This can interfere with the immune response, causing children to experience longer wound healing with a higher risk of infection and disease complications.¹³

Patients also showed symptoms of global developmental delay. When there is concern about the quality or progress of the child's motor development, the evaluation begins with a complete physical examination, with particular attention to the neurological examination and evaluation of vision and hearing.¹⁵ Developmental delays cover a broad spectrum of disorders or delays in milestones according to the child's age.¹⁶

4. Conclusion

Management of intestinal malrotation with volvulus in this patient includes general improvement and rehydration, Ladd's procedure for definitive correction of the cause. Management of comorbid global developmental delay is carried out after the emergency is resolved.

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