



# Meckel's Diverticulum-Induced Small Bowel Obstruction in an Adolescent: A Surgical Management Case Study

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**How to cite this paper:** Dieudonne, M., Dionys, N., Patrick, H., François, N. and Yves, B. (2025) Meckel's Diverticulum-Induced Small Bowel Obstruction in an Adolescent: A Surgical Management Case Study. *Open Access Library Journal*, 12: e13162. <https://doi.org/10.4236/oalib.1113162>

**Received:** February 25, 2025

**Accepted:** April 27, 2025

**Published:** April 30, 2025

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## Abstract

**Background:** Meckel's diverticulum is the most prevalent congenital small bowel abnormality, which occurs when the omphalomesenteric duct fails to completely obliterate during the eighth week of pregnancy. Only 4% - 16% of individuals exhibit symptoms, while most patients are asymptomatic. Gastro-intestinal bleeding is the most frequent occurrence in children; in contrast, intestinal obstruction is the most common complication in adulthood. The majority of Meckel's diverticula are discovered incidentally during surgery for another reason, and they are more common in male patients. This case report aimed to describe the diagnosis and treatment of a small bowel obstruction caused by Meckel's diverticulum in an adolescent patient who underwent successful surgery without complications. **Case Presentation:** 17-year-old male patient without medical or surgical history, who presented to the emergency department with severe abdominal pain, vomiting for six days duration abdominal distension, tenderness, absent bowel sounds, and stopped stools and flatus. The lab blood test findings were without abnormalities except the high level of creatinin but the plain abdominal radiography revealed dilated loops of the small bowel. A small bowel obstruction was highly suspected diagnosis for this case. In the surgical theatre, an urgent exploratory laparotomy was made, a small bowel volvulus around a bead of Meckel's diverticulum and necrosis of the entire ileum and part of the jejunum was identified. ileojejunal resection leaving 2 m of jejunum, and jejunostomy in the right iliac fossa were performed. In postoperative time, the patient was admitted in intensive care unit, 48 hours later he was transferred to the surgical ward where the postop-

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erative care was made until the discharge. The course of treatment took 28 days totally. In his assessment 5 months later, any digestive disorders and symptoms found, such as diarrhea and others, no electrolyte imbalances occurred in the postoperative period. **Conclusion:** Small bowel obstruction caused by a Meckel's diverticulum is a rare and diagnostically challenging condition. Pre-operative diagnosis requires a high level of suspicion, particularly in settings where advanced imaging is limited. In such cases, exploratory laparotomy remains the most reliable method for an accurate diagnosis.

## Subject Areas

Clinical Medicine

## Keywords

Small Bowel Obstruction, Meckel's Diverticulum, Jejunostomy, Ileojejunal Resection, Small Bowel Volvulus

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## 1. Introduction

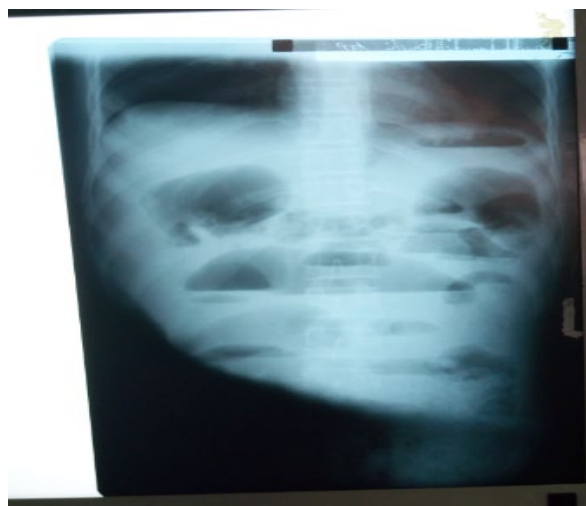
The most prevalent congenital small bowel abnormality, Meckel's diverticulum, occurs when the omphalomesenteric duct fails to completely obliterate during the eighth week of pregnancy [1]. The term "rule of twos" describes Meckel's diverticulum, a true diverticulum that arises from the small bowel's antimesenteric barrier [2]. Only 4% - 16% of individuals exhibit symptoms, while most patients are asymptomatic [3]. Gastrointestinal bleeding is the most frequent occurrence in children; in contrast, intestinal obstruction is the most common complication in adulthood [4].

Although Meckel's diverticulum affects both sexes equally frequently, the signs of its consequences are more pronounced in men than women. The majority of Meckel's diverticula are discovered incidentally during surgery for another reason, and they are more common in male patients [5]. Here, we describe the diagnosis and treatment of a small bowel obstruction caused by Meckel's diverticulum in an adolescent patient who underwent successful surgery without complications.

## 2. Case Presentation

We report a 17-year-old male patient, weighing 47 kg, who presented to the emergency department of Kamenge Military Hospital in Bujumbura, Burundi, in July 2021 with severe abdominal pain, vomiting for six days, and stopped stools and flatus. He had abdominal distension, tenderness, absent bowel sounds, BP of 100/50 mmHg, HR of 100 beats per minute, respiratory rate of 23 breaths per minute, and no palpable mass. The findings of the rectal digital examination were unremarkable. He had no medical or surgical history and was febrile (38.5°C). Plain abdominal radiography revealed dilated loops of the small bowel without

free air under either diaphragm (**Figure 1**). The laboratory blood test findings were as follows (**Table 1**). Preoperative diagnosis was difficult; however, the patient was resuscitated with rehydration using normal saline and dextrose 10%. A nasogastric tube and Foley catheter were inserted, and small bowel obstruction was suspected.



**Figure 1.** The small bowel's air fluid level on the abdominal X-ray. This is the picture of plain abdominal X-ray took in emergency department before surgery.

**Table 1.** Lab blood test results in the emergency department.

Blood test	Lab results level	reference range	unit
White blood cells (WBC)	$9.5 \times 10^9$	4.5 - 10	$10^9/l$
Hemoglobin (Hb)	10.9	12 - 16	gr/dl
platelets	207,000	150 - 400	$10^3/\mu l$
Creatinine	169	55 - 98	$\mu mol/l$
Blood sugar	6	4.2 - 6.4	mmol/l
Sodium level	135.4	135 - 148	meq/l
Potassium level	5.21	3.5 - 5.3	mmol/l
Chloride level	99.9	97 - 108	meq/l

After four hours, the patient's parameters were stable, and no other imaging examinations were possible at that time. The patient was brought into the surgical theatre, where an urgent exploratory laparotomy took place while the patient was under general anesthesia.

A xipho-pubic median laparotomy was performed, and upon entering the peritoneal cavity, a small bowel volvulus around a bead of Meckel's diverticulum with an adhesion at the top was identified. Necrosis of the entire ileum and part of the jejunum was also noted. The section of the straps allowing the cord to loosen the diverticular cord, ileojejunal resection leaving 2 m of jejunum, and jejunostomy in the right iliac fossa (**Figures 2-4**) were performed.



**Figure 2.** The picture taken during surgery showing extensive necrosis involving the entire ileum and a segment of the jejunum.



**Figure 3.** The diverticular cord around the small intestine. This is a picture taken during surgery. It shows the diverticular cord around the small intestine.



**Figure 4.** The Meckel's diverticulum removed. Picture taken during surgery showing the Meckel's diverticulum and the entire segment of bowel necrosis.

### 3. Postoperative Course Treatment and Follow up

After surgery, the patient was admitted to the intensive care unit for postoperative care, and intravenous fluids had been administered with antibiotics and Analgesics drugs. In ICU, 48 hours later after surgery the patient was stable, flatus was present, and he started oral feeding. 72 hours postoperative, the patient was transferred to the surgical ward. The operative wound care and jejunostomy were dressed on time. The patient did not develop surgical wound infection.

In the first thirteen postoperative days with jejunostomy, the patient lost ten kilograms. The surgery for restoring digestive continuity was done at day fourteenth postoperative. The patient was discharged on day thirteen post second surgery, weighting 42 kg. The length of hospital stay duration was 28 days in total. Five months after the surgery, the patient weighed 52 kg. In his assessment, any digestive disorders and symptoms found, such as diarrhea and others, no electrolyte imbalances occurred in the postoperative period.

### 4. Discussion and Literature Review

Meckel's diverticulum is the most common aberration (90%) caused by the partial obliteration of the omphalomesenteric duct between weeks five and seven of pregnancy, despite being a rare cause of small intestine obstruction in adults [6]. Meckel's diverticulum is the most common congenital defect of the small intestine, occurring in approximately 1% - 3% of cases. It is a genuine diverticulum that contains all the layers of the intestinal wall. On average, it is 3 cm long, with 90% of them falling between 1 and 10 cm, and the longest one being 100 cm. On the antimesenteric border of the ileum, this diverticulum is typically located within 100 cm of the ileocecal valve [7]. It seems that the typical distance from the ileocecal valve changes with age; the typical distance for children less than two is 34 cm. The ileocecal valve and Meckel's diverticulum are normally separated by 67 cm in adults, and there is a 4% possibility of lifetime issues. Most cases of Meckel's diverticulum are asymptomatic [8]. Intussusception, volvulus of the diverticulum around a mesodiverticular band, expansion into the hernia sac, and trapping of a bowel loop by a mesodiverticular band can all result in obstruction. In our case, the obstruction was due to volvulus of the diverticulum around the small intestine.

As Khalifa *et al.* [9] did in their study, even though Meckel's diverticulum has been diagnosed using a variety of imaging modalities, including abdominal CT, sonography, and X-rays, our study's imaging examination was restricted to plain abdominal X-rays for the diagnosis of bowel obstruction.

It remains uncertain whether every case of incidental Meckel's diverticulum in asymptomatic patients requires surgical removal. Nonetheless, for patients displaying symptoms, diverticulum removal from the impacted bowel area should be consistently included in the management plan. The degree of surgical removal is determined by the specific complications faced and observations made during the operation [10].

The only management option in our case was emergency laparotomy, followed by resection of the necrotized part of the small intestine and jejunostomy.

Vishal Kumar G *et al.* [11] in Singapore found 6 cm of gangrenous small intestine, which was not resected, and end-to-end. In severe cases, open intestinal surgery is recommended for treatment. The diverticulum-containing intestinal segment, typically the ileum or upper intestines, is removed during surgery, and the healthy sections of the gut are reconnected. Given that 6.4% of people with Meckel's diverticulum experience difficulties from the disorder at some point in their lives, several studies have demonstrated that the consequences of surgery are more dangerous than the risk of preventive diverticulum removal [12]-[14].

Depending on the surgeon's judgment, the procedure could be as simple as isolating and removing the inflammatory pouch or more complex. Due to widespread inflammation, blockage, or imprisonment in an inguinal hernia (Littre's hernia), the surrounding tissue is excised in the latter situations [15]-[17].

To prevent recurrence, additional tissue is removed. Laparoscopic or minimally invasive diverticulectomy has been shown to be feasible in recent studies using small cameras and incisions [18].

According to the findings of different authors, recovery was prolonged due to ileus, and most patients were discharged on postoperative day 8, recovery can be compromised by some complications, and the hospital stay can be influenced by the patient's status after surgery [19] [20]. In our case, approximately 4 m of the ileum and jejunum were resected, and a jejunostomy was performed. The recovery was prolonged owing to jejunostomy; however, the patient did not present with postoperative complications related to the resected small bowel segment, according to the follow-up results. The patient was discharged on day 17 postoperative.

## 5. Conclusion

Small bowel obstruction caused by a Meckel's diverticulum is a rare and diagnostically challenging condition. Preoperative diagnosis requires a high level of suspicion, particularly in settings where advanced imaging is limited. In such cases, exploratory laparotomy remains the most reliable method for an accurate diagnosis.

## Authors' Contributions

All authors contributed equally to this study.

Maniragaba Dieudonne MD: Performed the surgery, drafting the manuscript, supervision.

Nsanzabagenzi Dionys MD: Drafting manuscript, interpretation of data, Critical review.

Bizoza Yves MD: Drafting the manuscript, interpretation of data, critical review.

Nduwimana François MD: Drafting manuscript, interpretation of data, critical review.

Hakizimana Patrick MD: Critical review, interpretation of data, drafting manuscript.

## Disclosures

### Financial Statement

All authors declare no financial support received for this study.

### Conflicts of Interest

The authors declare no conflicts of interest.

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