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Complicated Meckel's Diverticulum Presenting as Pneumoperitoneum in an Adolescent

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Male, 18-year-old
Final Diagnosis: Bowel perforation • Meckel's diverticulum
Symptoms: Abdominal pain • peritonitis
Clinical Procedure: Bowel resection • diagnostic laparoscopy • explorative laparatomy
Specialty: Pediatrics and Neonatology • Surgery

Objective: Unusual clinical course

Background: The finding of pneumoperitoneum frequently leads to operative management for diagnosis and treatment. The etiology of pneumoperitoneum includes perforated viscus, such as perforated peptic ulcers, small or large intestinal perforations, appendicitis, and complicated sigmoid diverticulitis. We describe the preoperative, intraoperative, and postoperative course of a patient with perforated Meckel's diverticulitis presenting with pneumoperitoneum. This unusual presenting finding highlights that Meckel's diverticulum should be included in the differential diagnosis in adolescents and young adults presenting with pneumoperitoneum.

Case Report: We describe a case of an 18-year-old male who presented with 1 day of abdominal pain, found to have pneumoperitoneum during workup, attributed to perforated Meckel's diverticulum. CT scans of the abdomen and pelvis were performed, confirming pneumoperitoneum, an inflamed segment of distal ileum, and a non-visualized appendix, which made the diagnosis difficult. Perforated Meckel's diverticulum, likely due to infection, was confirmed by diagnostic laparoscopy. The Meckel's diverticulum was then exteriorized and removed by segmental small bowel resection with primary anastomosis. The final pathology report confirmed perforated Meckel's diverticulum with gastric oxyntic-type mucosa.

Conclusions: This case illustrates an uncommon presentation of Meckel's diverticulum in an adolescent with pneumoperitoneum. Pneumoperitoneum requires broadening the diagnosis to include other causes, including Meckel's diverticulum, especially in the setting of an acute abdomen. This case highlights that a high index of suspicion should be kept for Meckel's diverticulum, even in adolescents and young adults with pneumoperitoneum.

Keywords: Adolescent • Diverticulitis • General Surgery • Pneumoperitoneum

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/945206

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Introduction

Meckel's diverticulum is a congenital anomaly that occurs in the gastrointestinal tract in about 2% of the population [1,2]. Symptoms can include sudden-onset pain, nausea, vomiting, abdominal tenderness, peritoneal signs, and leukocytosis [3]. Diagnostic workup can reveal non-specific inflammation in the small bowel on radiographic imaging, and technetium-99m pertechnetate nuclear scans (Meckel's scans) can be helpful in diagnosis if gastrointestinal bleeding is present. Meckel's diverticulum is commonly silent and rarely presents with symptoms [3]. The lifetime risk of complications, such as diverticulitis, intussusception, intestinal obstruction, bleeding, and perforation, from Meckel's diverticulum arises in about 4-6% of people, with increased prevalence under 10 years of age [1,4-7]. The prevalence of symptomatic Meckel's diverticulum is 25-50% in children less than 10 years of age [8-11]. Complications from Meckel's diverticulum in adolescence can mimic other presentations such as inflammatory bowel disease (IBD), appendicitis, and bowel obstruction [6]. Meckel's diverticulum is often diagnosed during surgery and is treated with diverticulectomy or segmental small bowel resection, depending on the size of the base and severity of bowel inflammation. We describe a case of perforated Meckel's diverticulitis in an adolescent who presented with pneumoperitoneum.

Case Report

An 18-year-old male with no significant medical history presented with 1 day of acute-onset, severe periumbilical pain. He initially presented to an outside hospital, where a computed tomography (CT) scan was obtained showing pneumoperitoneum and small bowel enteritis in the mid-abdomen. On the same day, he presented to our emergency room reporting non-bilious non-bloody emesis following the onset of pain and worsening pain during the car ride to our emergency department. He denied weight loss, fever, chest pain, shortness of breath, diarrhea, constipation, melena, hematochezia, hematuria, joint pain, and/or skin changes. He had no history of previous endoscopy or colonoscopy and no history of similar symptoms in the past. At the time of presentation, his vital signs were significant for intermittent tachycardia to the 120s. On physical exam, the patient had periumbilical tenderness with rebound tenderness and guarding. Pertinent laboratory values were a white blood cell count of 20.4, neutrophilia of 87%, and anemia with a hemoglobin of 10.7. An upright chest and abdominal X-ray demonstrated a non-obstructive bowel gas pattern (**Figure 1**). A left lateral decubitus film showed small foci of gas above the liver, concerning for free air versus bowel gas (**Figure 2**). As images from the outside hospital were unavailable, a repeat CT scan of the abdomen and pelvis with oral and intravenous contrast was performed, confirming

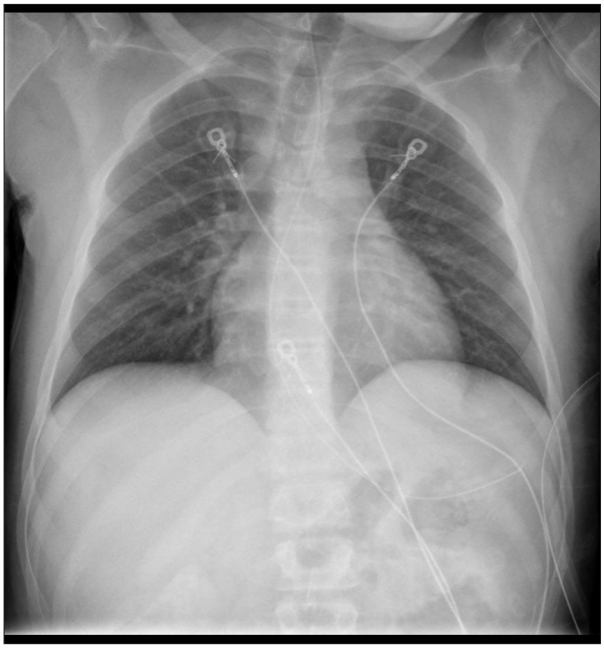

Figure 1. Normal chest X-ray with non-obstructive bowel gas pattern.

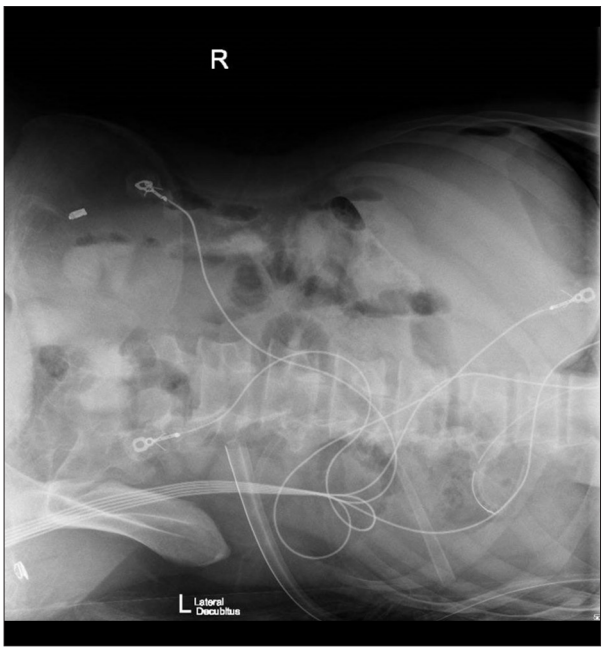

Figure 2. Left lateral decubitus abdominal X-ray showing small foci of gas above the liver, concerning for free air versus bowel gas.

pneumoperitoneum, an inflamed segment of distal ileum, and a non-visualized appendix (**Figures 3-5**). The differential diagnosis from the scan included perforated viscus, possibly from the appendix or small intestine.

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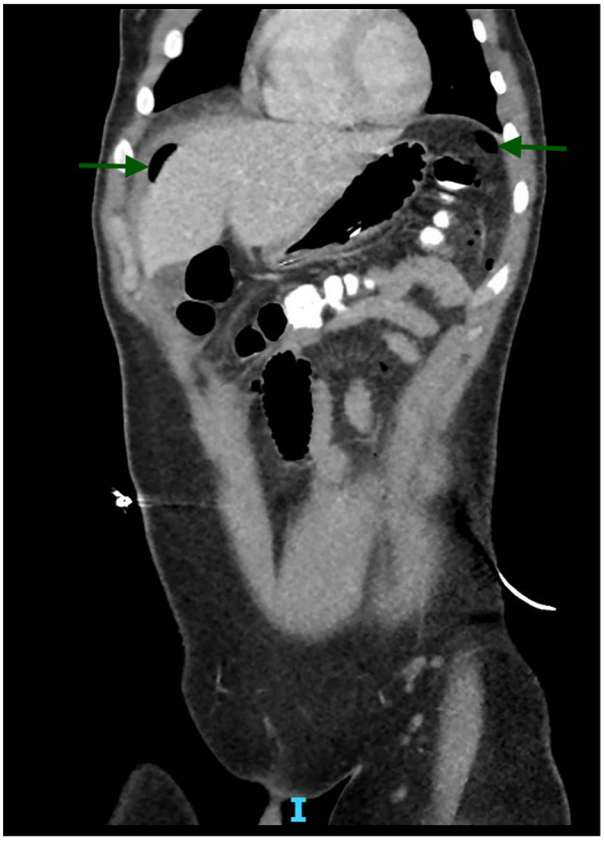

Figure 3. Coronal CT scan of abdomen and pelvis with pneumoperitoneum. Foci of free air noted by green arrows.

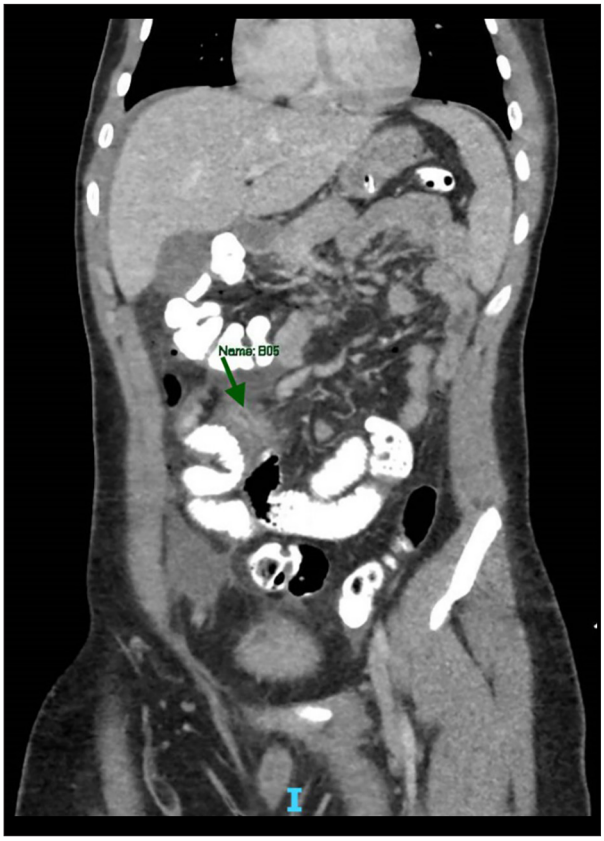

Figure 4. Coronal CT scan of abdomen and pelvis with inflamed segment of distal ileum noted by green arrow. No visualized appendix on coronal images.

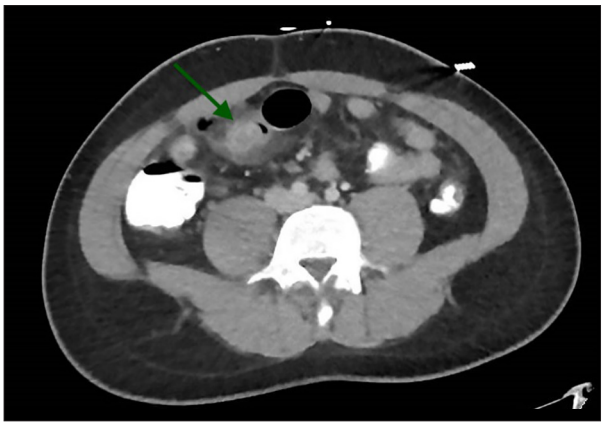

Figure 5. Axial CT scan of abdomen and pelvis with inflamed segment of distal ileum noted by green arrow. No visualized appendix on axial images.

The patient was taken for emergency operative exploration. Diagnostic laparoscopy was performed first and revealed a moderate amount of murky fluid and fibrinous exudate in the abdomen, especially in the right paracolic gutter, pelvis, and perihepatic region. The cecum was identified in the right lower quadrant of the abdomen and the appendix appeared normal (**Figure 6**). The small intestine was then carefully examined beginning at the ileocecal valve and run proximally until an inflamed segment of ileum was encountered, covered by omentum. The omentum was carefully peeled off, revealing the intestinal perforation. The exact distance from the terminal ileum was not measured at the time; however, it was within 60 cm of the ileocecal valve. Spillage was controlled and this segment was exteriorized through an infraumbilical midline incision. Upon further evaluation, it was noted to be a wide-based, perforated Meckel's diverticulum (**Figure 7**). The cause of the perforation was likely infection causing Meckel's diverticulitis. A segmental resection and stapled primary anastomosis were performed. The abdomen was irrigated with normal saline and closed.

Intravenous Zosyn was continued postoperatively during the hospital stay until discharge. After bowel function returned postoperatively, diet was slowly advanced. On postoperative day (POD) 6, the patient had decreased oral intake, profuse diarrhea, and recurrent abdominal pain. A CT scan of the abdomen and pelvis showed a complex 9×5 cm fluid collection extending to a small collection in the upper pelvis (**Figure 8**). This was treated with percutaneous drainage by interventional radiology (IR), with significant improvement. On POD 9, the

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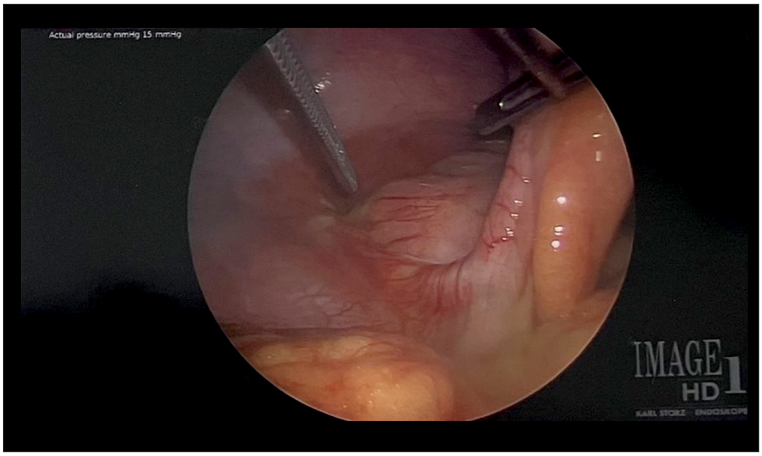

Figure 6. Intraoperative photo showing normal appendix during diagnostic laparoscopy.

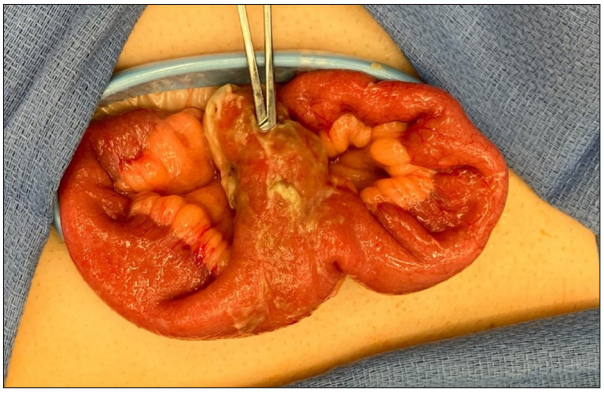

Figure 7. Intraoperative photo showing wide-based, perforated Meckel's diverticulum.

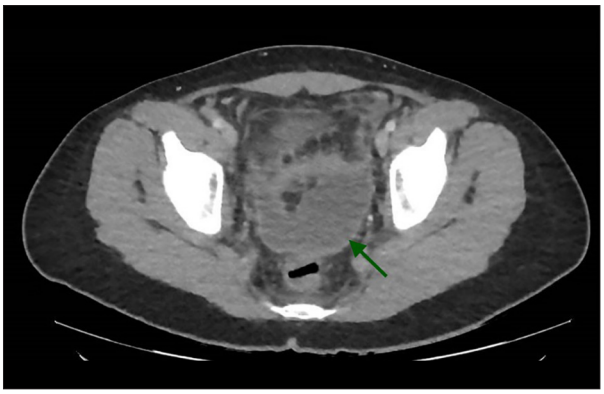

Figure 8. Axial CT scan of abdomen and pelvis showing a complex 9×5 cm fluid collection, noted by green arrow, extending to a small collection in the upper pelvis.

patient was tolerating regular diet, with minimal output from the IR drain and it was removed. He was discharged on oral Cefuroxime and Flagyl for an additional 7 days. The final pathology report confirmed a perforated Meckel's diverticulum with gastric oxyntic-type mucosa and acute and chronic inflammation. He followed at our office after 1 month with no acute complications or problems since hospital discharge.

Discussion

The case presented describes an unusual presentation of Meckel's diverticulum in an adolescent that was successfully treated with a laparoscopic-assisted segmental small bowel resection and primary anastomosis. Meckel's diverticulum is usually asymptomatic or incidentally found. When a patient is symptomatic, it should be included in the differential diagnosis in the setting of pneumoperitoneum without clear etiology [12]. Meckel's diverticulitis presenting as pneumoperitoneum in adolescents is rare, which makes this case an uncommon presentation and should remind clinicians to include it in the differential diagnosis. In contrast to our patient, complicated Meckel's diverticulum can present with neoplasm, small bowel obstruction, and bleeding [7,13]. Additionally, Meckel's diverticulitis without perforation can occur, but is not common in this age group. Rarely, Meckel's diverticulum can present with perforation and pneumoperitoneum [13]. Our patient was an adolescent, which is an uncommon age for complicated Meckel's diverticulitis because 25-50% of symptomatic Meckel's diverticulum cases present before 10 years of age, with decreasing incidence as age increases [7,14]. The literature includes some rare cases of perforated Meckel's diverticulum in adults; however, the frequency of perforation and imaging finding pneumoperitoneum in adolescents is low [7,13,15].

Our patient was 18 years old and presented with acute-onset pain, peritoneal signs on examination, and pneumoperitoneum. The etiology of the pneumoperitoneum was in question because of the non-visualized appendix and small bowel inflammation. IBD with perforation was considered due to small bowel inflammation; however, the patient was previously healthy with no symptoms related to IBD, and no family history, prior to presentation. Perforated appendicitis was also considered because there was significant inflammation in the right lower quadrant of the abdomen on CT scan and a non-visualized appendix. This inflammatory process on CT scan could have been caused by a reactive process from perforated appendicitis or

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from IBD. Since the patient was hemodynamically stable and abdominal distension was minimal, a diagnostic laparoscopy was performed first, which confirmed hollow viscus perforation. The decision to perform a segmental resection was based on the finding of a wide-based, perforated Meckel's diverticulum. Our patient's presentation was uncommon because most presentations of complicated Meckel's diverticulum occur in younger age groups. The usual presentations of complicated Meckel's diverticulum that our patient had included acute-onset abdominal pain, emesis, and the finding of small bowel inflammation on CT scan. Pneumoperitoneum is a rare presenting finding of Meckel's diverticulitis, especially in patients with a non-visualized appendix and no history of IBD symptoms.

Conclusions

In summary, this case illustrates an unusual presentation of Meckel's diverticulum in an adolescent with pneumoperitoneum as opposed to Meckel's diverticulitis without perforation, bleeding, intussusception, obstruction, or isolated abdominal pain, which are more common presenting symptoms and findings. Pneumoperitoneum on imaging requires broadening the diagnosis to include other causes including Meckel's diverticulum, especially in the setting of an acute abdomen. This case shows that a high index of suspicion should be kept for Meckel's diverticulitis, even in adolescents and young adults with pneumoperitoneum.

Institution Where Work Was Done

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Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

References:

1. Al Laham O, Albrijawy R, Alsamman MI, et al. Spontaneously perforated Meckel;s diverticulum due to diverticulitis with histopathological finding of gastric mucosa in an adult female – a case report. Int J Surg Case Rep. 2021;89:106619
2. Zabalza San Martin L, Rubio Iturria S, Vicuna Arregui M, Rodriguez Gutierrez C. Perforated Meckel's diverticulitis in an adult as an atypical cause of abdominal pain. Gastroenterol Hepatol. 2019;42(9):566-67
3. Hansen CC, Soreide K. Systematic review of epidemiology, presentation, and management of Meckel's diverticulum in the 21st century. Medicine (Baltimore). 2018;97(35):e12154
4. Sharma RK, Jain VK. Emergency surgery for Meckel's diverticulum. World J Emerg Surg. 2008;3:27
5. Kuru S, Kismet K. Meckel's diverticulum: Clinical features, diagnosis and management. Rev Esp Enferm Dig. 2018;110(11):726-32
6. Green ME, Brahmbhatt B, Baumgarten D, et al. Meckel's diverticulum masquerading as Crohn disease. Inflamm Bowel Dis. 2020;26(11):e150-e51
7. Parvanescu A, Bruzzi M, Voron T, et al. Complicated Meckel's diverticulum: Presentation modes in adults. Medicine (Baltimore). 2018;97(38):e12457
8. Cullen JJ, Kelly KA, Moir CR, et al. Surgical management of Meckel's diverticulum. An epidemiologic, population-based study. Ann Surg. 1994;220(4):564-68; discussion 568-69
9. Park JJ, Wolff BG, Tollefson MK, et al. Meckel diverticulum: The Mayo Clinic experience with 1476 patients (1950-2002). Ann Surg. 2005;241(3):529-33
10. Ruscher KA, Fisher JN, Hughes CD, et al. National trends in the surgical management of Meckel's diverticulum. J Pediatr Surg. 2011;46(5):893-96
11. Zani A, Eaton S, Rees CM, Pierro A. Incidentally detected Meckel diverticulum: To resect or not to resect? Ann Surg. 2008;247(2):276-81
12. Kawamoto S, Raman SP, Blackford A, et al. CT detection of symptomatic and asymptomatic meckel diverticulum. Am J Roentgenol. 2015;205(2):281-91
13. Elsayes KM, Menias CO, Harvin HJ, Francis IR. Imaging manifestations of Meckel's diverticulum. Am J Roentgenol. 2007;189(1):81-88
14. Menezes M, Tareen F, Saeed A, et al. Symptomatic Meckel's diverticulum in children: A 16-year review. Pediatr Surg Int. 2008;24(5):575-77
15. Grasso E, Politi A, Progno V, Guastella T. Spontaneous perforation of Meckel's diverticulum: Case report and review of literature. Ann Ital Chir. 2013;84(ePub): S2239253X13020902

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