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Evaluation of Diagnostic Methods for Complications of Meckel's Diverticulum: A Retrospective Analysis

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ABSTRACT

Meckel's diverticulum (MD) is the most common congenital abnormality of the small intestine, often asymptomatic but occasionally presenting with acute abdominal symptoms that can mimic other conditions such as appendicitis, perforated peptic ulcer, or bowel obstruction. This study reviews eight cases of MDs diagnosed and treated surgically, highlighting the clinical presentations, diagnostic challenges, and surgical outcomes.

This retrospective study included seven male and one female patients aged 18 to 43 who presented to the emergency department with symptoms of acute abdomen. Imaging studies, including abdominal computerised tomography (CT) scans and ultrasonography, were utilized to assess the patients. Laparoscopic surgery was performed in six cases, while two cases required open surgery. Surgical management involved excision of the Meckel's diverticulum using a linear stapler.

All patients presented with severe abdominal pain, and physical examination revealed signs of acute abdomen such as tenderness, guarding, and rebound tenderness. Initial diagnoses included appendicitis, perforated peptic ulcer, mechanical bowel obstruction, and foreign body ingestion. Intraoperative findings confirmed the presence of Meckel's diverticulum in all cases. The excision of the diverticulum was successfully performed, and all patients had uneventful postoperative recoveries. The mean hospital stay was 3.75 days, and no major complications were observed.Meckel's diverticulum can present with a wide range of symptoms, often mimicking other abdominal conditions, making early diagnosis and appropriate surgical intervention essential. Laparoscopic surgery is a safe and effective approach for the excision of Meckel's diverticulum, with favorable outcomes and minimal complications. Prompt recognition and treatment are key to ensuring optimal patient outcomes.

Keywords: Acute abdomen, Laparoscopy, Meckel's diverticulum

Introduction

Meckel diverticulum (MD) is the most common congenital malformation of the gastrointestinal system, accounting for 97% of omphalomesenteric duct malformations (1). Although it is more common in infants, it is less common in adults. Meckel diverticulum, found in 0.14 to 4.5% of postmortem autopsy series, can rarely be symptomatic in adults (2). It is generally known as the "rule of 2" in the adult age group. It affects 2% of the population, is 2 feet away from the ileocecal junction (approximately 60 cm proximal), 2 inches long (3-4 cm), twice as common in males, twice as common in children under 2 years of age, and contains 2 types of mucosa (gastric and pancreatic) (3,4). The histology of the Meckel diverticulum is similar to the histology of the ileum. It is a true diverticulum because it contains all wall layers. It has a 4% lifetime complication risk (5). It may contain ectopic mucosal tissues, mostly gastric, pancreatic, duodenal, colonic, Brunner gland, hepatobiliary, and endometrial (6). While it usually presents symptoms of bleeding in children, adult patients may present with intestinal obstruction due to intussusception or adhesion bands (4). Complications such as obstruction, bleeding, diverticulitis, ulceration, or perforation may develop. When complications develop, clinical suspicion is the most important diagnostic situation. Because imaging methods may not be diagnostic, in some patients, they may be detected incidentally during surgery. Despite the low complication risk, it should be kept in mind in the differential diagnosis of acute abdomen by emergency and general surgeons because its complications are serious and

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frequently require surgical intervention in cases where complications develop (7).

In this article, we aimed to examine eight patients who underwent surgery due to acute abdomen and had complications related to Meckel diverticulum.

Cases

Case 1: A 20-year-old male patient was admitted to the emergency department due to severe abdominal pain in the right lower quadrant that started 3 hours ago. The patient, who had no known chronic disease and no specific family history, had generalized tenderness in all abdominal quadrants, with a defensive rebound in the right lower quadrant on physical examination. Hemorrhage in the form of abundant hematochezia was detected in the rectal examination. Arterial blood pressure was 90/60 mmHg, and pulse rate was 120/min. The patient's hemoglobin (Hg) value was 14 g/dL, and the Hg value measured 1 hour later was 10 g/dL. In the ultrasonography; the appendix diameter was measured as 6 mm. A dense fluid collection measuring 5 cm in the deepest part of the pelvis was observed. It was decided to perform a diagnostic laparoscopy on the patient who presented with an acute abdomen. Laparoscopic exploration revealed widespread hemorrhage in the abdomen, a perforated and actively bleeding Meckel diverticulum 60 cm proximal to the ileocecal junction (figure 1). The appendix was observed to be intact. A laparoscopic diverticulectomy was performed. He was discharged on the 4th postoperative day.

Case 2: A 25-year-old male patient was admitted to the emergency department with complaints of abdominal pain and vomiting for 3 days. Physical examination revealed widespread tenderness, and defense rebound in the abdomen, and the patient was in the acute abdomen. He had a history of open abdominal surgery and midline incision due to perforated appendicitis. Computerized tomography showed dilatation of intestinal loops, increased wall thickness, and an image consistent with mechanical intestinal obstruction (figure 2). Rotated ileal loops due to MD were present in laparoscopic exploration. After the rotation was corrected, Meckel diverticulitis was excised using a linear stapler. The patient was discharged on the 3rd postoperative day.

Case 3: A 22-year-old male patient was admitted to the emergency department due to abdominal pain that started 1 day ago and increased in intensity. Physical examination revealed tenderness, defense, and rebound in all abdominal quadrants. Due to the detection of widespread fluid and free air in the abdomen on CT, he was taken to emergency surgery with a preliminary diagnosis of perforation. Laparoscopic exploration revealed free purulent fluid in the abdomen. Meckel diverticulitis and perforation were detected here. Meckel diverticulum was resected and removed with the help of a linear stapler. He was discharged on the 5th postoperative day.

Case 4: A 20-year-old male patient presented to the emergency department with complaints of severe abdominal pain. Physical examination revealed tenderness, defense, and rebound in the right lower quadrant. The patient was reported to have acute appendicitis due to increased appendix contrast and wall thickness in the abdominal CT scan. Due to these findings, the patient was taken to surgery with a preliminary diagnosis of acute appendicitis. The appendix was found to be normal in the laparoscopic exploration. Meckel diverticulitis was detected in the small bowel exploration. Diverticulitis was excised with the help of a linear stapler. The patient was discharged on the 3rd postoperative day.

Case 5: A 43-year-old male patient presented to the emergency department with complaints of severe abdominal pain. On physical examination, tenderness, guarding, and rebound tenderness were noted in the right upper quadrant. An abdominal CT scan revealed contamination in the prepyloric area, free fluid, and air in the subhepatic area. The patient was taken to surgery with a preliminary diagnosis of perforated peptic ulcer. During laparoscopic exploration, no findings consistent with perforated peptic ulcer were observed. Further extensive exploration revealed Meckel's diverticulitis. The diverticulitis was excised using a linear stapler. The patient was discharged on the 3rd postoperative day.

Case 6: A 32-year-old male patient presented to the emergency department with complaints of severe abdominal pain, nausea, vomiting, and swelling in the right lumbar region. On physical examination, tenderness was noted in all abdominal quadrants, and swelling consistent with an incarcerated hernia defect was observed in the right lumbar region. The ultrasonographic evaluation revealed a hernia defect containing a non-vascularized loop of the bowel. The patient was taken to emergency surgery for an irreducible hernia. Open surgery revealed the hernia defect and a Meckel diverticulum was found within the hernia sac. The diverticulum was excised using a

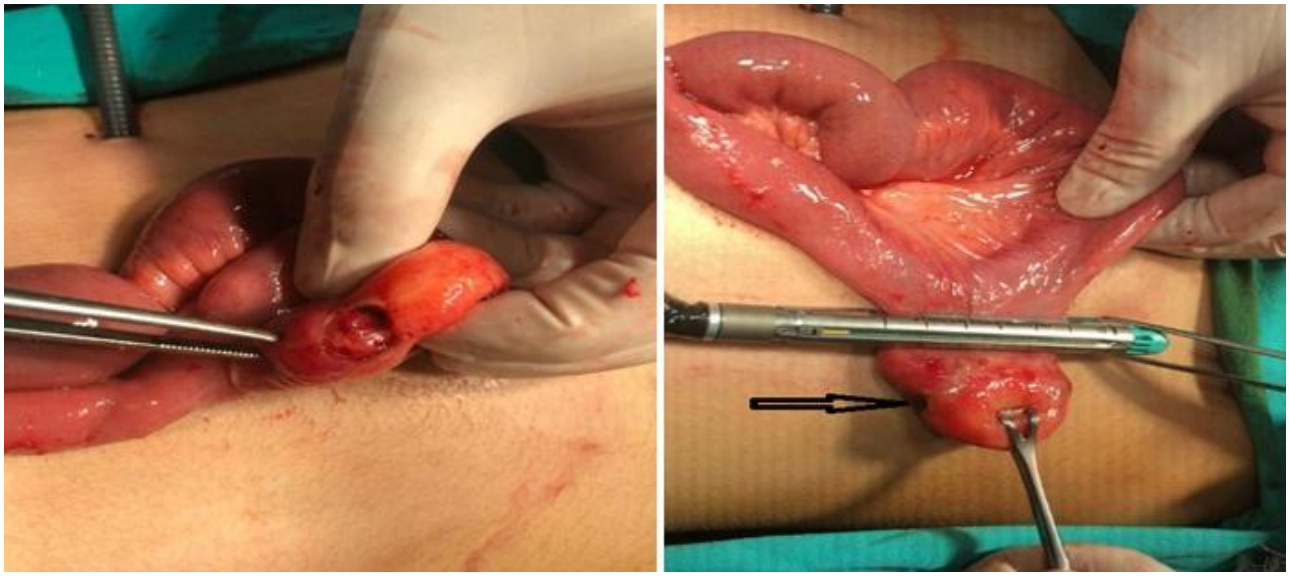

Fig. 1. Perforated Meckel Diverticulum

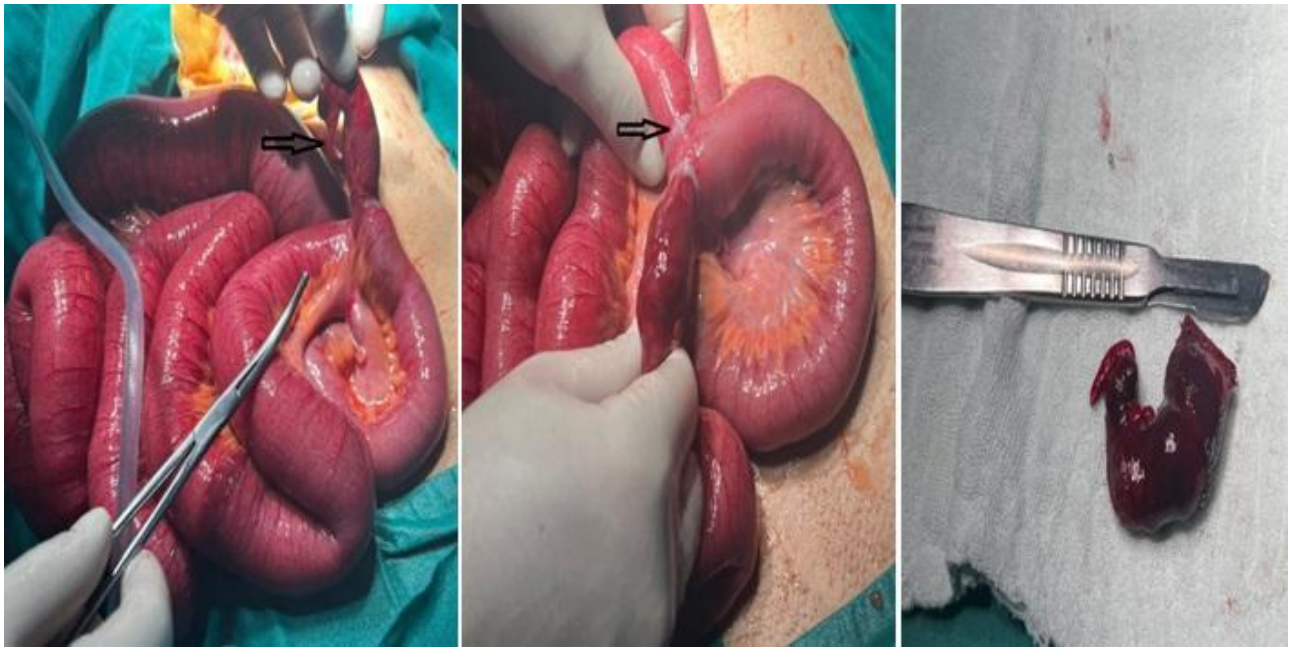

Fig. 2. Obstruction due to Meckel's diverticulitis

linear stapler. The patient was discharged on the 4th postoperative day.

Case 7: An 18-year-old female patient with mental retardation presented with foreign body ingestion. The patient, who had no complaints during follow-up, came to the emergency department on the 15th day with severe abdominal pain. Physical examination revealed tenderness, guarding, and rebound tenderness in the right lower quadrant. An abdominal CT scan showed a normal appendix. A foreign body image was observed in the midline of the abdomen. The patient, with signs of acute abdomen, was scheduled for emergency surgery. Laparoscopic exploration revealed that Meckel's diverticulum had been perforated by a needle (figure 3). The diverticulum was excised using a linear stapler. The patient was discharged on the 4th postoperative day.

Case 8: A 65-year-old male patient presented with complaints of abdominal pain, abdominal distension, nausea, and vomiting. On physical examination, tenderness was noted in all abdominal quadrants. An upright abdominal X-ray revealed air-fluid levels. An abdominal CT scan showed a spiral arrangement of small bowel loops on the right side of the abdomen, with intense contrast enhancement suggesting a mass

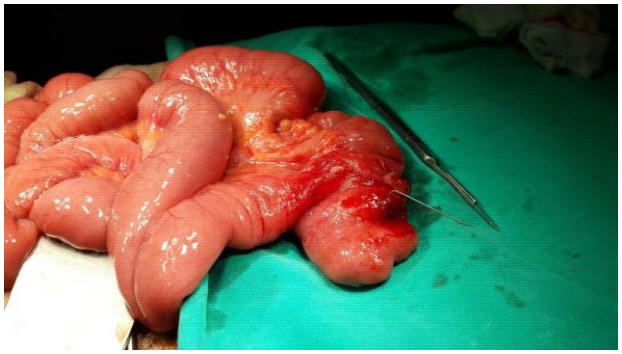

Fig. 3. The Meckel's diverticulum perforated by a needle

formation. The patient was taken to emergency surgery with a preliminary diagnosis of intestinal obstruction secondary to malignancy. During laparotomy, obstruction was found to be caused by Meckel's diverticulum. The diverticulitis was excised using a linear stapler. The patient was discharged on the 3rd postoperative day.

Results

A total of eight cases of Meckel's diverticulum (MD) presenting with acute abdominal symptoms were analyzed. The patients ranged in age from 18 to 43 years, with a male predominance (7 out of 8 cases). The surgical approach varied between laparoscopic and open surgery, with laparoscopic techniques being more commonly employed (6 cases), and open surgery being used in two instances.

The most common presenting symptom was severe abdominal pain, which was reported in all cases. In most instances, physical examination revealed tenderness, guarding, and rebound tenderness, suggesting an acute abdomen. Imaging studies, including abdominal CT scans and ultrasonography, were crucial in identifying the presence of Meckel's diverticulum in the majority of cases, though the preoperative diagnosis varied, with initial suspicion of appendicitis, perforated peptic ulcer, bowel obstruction, or foreign body ingestion.

In six cases, the primary surgical finding was Meckel's diverticulitis or perforation, and in one case, MD was found within an incarcerated hernia. In one case, MD had been perforated by a foreign object (a needle). In all cases, the treatment involved excision of the Meckel's diverticulum using a linear stapler.

Postoperative recovery was generally uneventful, with most patients discharged between the 3rd and 5th postoperative day. None of the patients experienced significant complications, and all had a favorable recovery. The mean duration of hospitalization was 3.75 days.

This series highlights the variable clinical presentations of Meckel's diverticulum, which can mimic other conditions such as appendicitis, peptic ulcer perforation, and bowel obstruction. Early diagnosis and surgical intervention are essential for optimal outcomes, and laparoscopic techniques offer a safe and effective approach for diverticulectomy in most cases (table 1).

Discussion

Meckel's diverticulum can be detected incidentally, but it can also present with acute conditions. Yamaguchi et al. reported that among 600 adult patients, 287 of whom were symptomatic, 36.5% had intestinal obstruction, 13.7% intussusception, 12.7% diverticulitis, 7.3% perforation, 11.8% bleeding, and 3.2% tumor in a retrospective study (1). The treatment for symptomatic Meckel's diverticulum is surgical. Open or laparoscopic procedures can be used (5). Routine resection of asymptomatic incidentally detected Meckel's diverticulum is not recommended (1). The most common complications in the literature are obstruction, diverticulitis, perforation, bleeding, and ulceration, which were also seen in our patients. All of our patients were young, with seven being male and one being female. One of our patients had a history of previous intra-abdominal surgery. All patients were taken into emergency surgery due to acute abdominal conditions. Laparoscopic surgery was performed in six cases, while two cases required open surgery and Meckel diverticulum complications were diagnosed during the operation. The most important tool in clarifying the clinical condition of the patients was to suspect Meckel diverticulum. Diverticulectomy was performed using a linear stapler during the operations. The patients were discharged without any problems during the service follow-up. No findings in favor of diverticulum were detected in the imaging methods performed on the patients before the operation, but suspicion was the most important element in reaching the diagnosis. Although scintigraphic methods have been described in the literature for diagnosing Meckel diverticulum, it is not effective to use these methods in every center and for patients examined in the emergency department with acute abdominal conditions (8). The diagnoses of

Table 1: Demographic Data and Surgical Technique, Preliminary Diagnosis, and Final Diagnosis For Each Case

Case	Age	Gender	Surgical Technique	Preliminary Diagnosis	Final Diagnosis
1	20	Male	Laparoscopic diverticulectomy	Acute abdomen suspected appendicitis	Perforated and bleeding Meckel's diverticulum
2	25	Male	Laparoscopic Meckel's diverticulectomy	Mechanical bowel obstruction (due to MD)	Rotation of Meckel's diverticulum and diverticulitis
3	22	Male	Laparoscopic diverticulectomy	Perforation, acute abdomen	Perforated Meckel's diverticulitis
4	20	Male	Laparoscopic Meckel's diverticulectomy	Suspected acute appendicitis	Meckel's diverticulitis
5	43	Male	Laparoscopic Meckel's diverticulectomy	Suspected perforated peptic ulcer	Meckel's diverticulitis
6	32	Male	Open surgery, Meckel's diverticulectomy	Incarcerated hernia (containing Meckel's diverticulum)	Meckel's diverticulum in hernia
7	18	Female	Laparoscopic diverticulectomy	Foreign body ingestion, acute abdomen	Perforated Meckel's diverticulum by needle
8	65	Male	Open surgery, Meckel's diverticulectomy	Bowel obstruction, suspected malignancy	Meckel's diverticulitis causes bowel obstruction

the patients were tried to be clarified with the help of CT. Diverticulum could not be diagnosed with CT, which is superior to other methods. (9) It was considered remarkable that 8 patients underwent emergency surgery due to various complications of MD in a center with a low population density within a year.

Result

Although Meckel's diverticulum is seen in the pediatric age group, it can also cause serious acute conditions in adults. Complications of Meckel's diverticulum should be suspected and kept in mind in the differential diagnosis of patients presenting with obstruction, gastrointestinal bleeding, and intestinal perforation.

Ethics Committee Approval: The study was approved by the Sırnak University non-invasive clinical research ethics committee (Date: 06.02.2025, Decision No: 2025/122004).

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