

Perforated Meckel's Diverticulum in an Adult

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Keywords

Gastrointestinal symptoms · Surgery · Gastrointestinal tract · Diagnosis · Computed tomography

Abstract

Meckel's diverticulum is the commonest congenital anomaly of the gastrointestinal tract. Its complications have an extensive variety of clinical and imaging manifestations, extending from benign and indolent findings to acute life-threatening conditions. Complicated Meckel's diverticulum often constitutes a challenging diagnosis for both the clinician and the radiologist. Therefore, imaging techniques play an important role in this condition in evaluating its complications, determining decision making. We describe a case of a 49-year-old man suffering from right abdominal pain with fever and constipation, during the past 5 days. Laboratory data revealed C-reactive protein of 306 mg/L and leukocytosis. Contrast-enhanced CT features were highly suggestive of perforated Meckel's diverticulum. The purpose of this article is to emphasize that besides its rarity, Meckel's diverticulum complications can occur in adult patients.

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Perfuração de divertículo de Meckel num adulto

Palavras Chave

Sintomatologia gastrointestinal · Cirurgia · Tracto gastrointestinal · Diagnóstico · Tomografia computadorizada

Resumo

O divertículo de Meckel é a anomalia congénita mais comum do tracto gastrointestinal. As suas complicações variam num amplo espectro, desde achados benignos e indolentes até condições potencialmente graves, e constituem frequentemente um desafio diagnóstico tanto para o clínico como para o médico radiologista. Neste sentido, os métodos de diagnóstico por imagem desempenham um papel importante na avaliação e extensão das suas complicações, determinando muitas vezes a tomada de decisões. Descrevemos um caso de um paciente de 49 anos, que apresenta dor abdominal lateralizada à direita, febre e obstipação, durante um período de 5 dias. Analiticamente apresenta valores de proteína C reactiva de 306 mg/L e leucocitose. O estudo TC contrastado foi muito sugestivo de divertículo de Meckel perfurado. O objectivo deste artigo é enfatizar que, apesar da sua raridade, as complicações do divertículo de Meckel podem ocorrer em pacientes em idade adulta.

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Introduction

Meckel's diverticulum (MD) is the commonest congenital anomaly of the gastrointestinal tract. It is a true diverticulum having all the layers of the intestinal wall [1, 2] and is usually localized in the pelvic or periumbilical region or right iliac fossa. The referred locations of MD are related to its complications. The preferred location is at the anti-mesenteric border of the ileum, 2 ft (60 cm) proximal to the ileocecal valve. The well-known "rules of 2" state that the MD occurs in about 2% of the population, it is about 2 inches in length, is usually located within 2 ft of the ileocaecal valve, and usually presents before 2 years of age [3]. MD results from the incomplete obliteration of the omphalomesenteric or vitelline duct during the 5th week of gestation [3].

MD manifests more commonly in children. However, complications can occur in adults and it may give rise to bleeding (11.8%), intestinal obstruction (36.5%), inflammation (12.7%), intussusceptions (13.7%), and neoplasm (3.2%). Perforation is very rarely seen and, in a review, was reported as being responsible for 0.5% of symptomatic diverticulum [4–6]. In adult patients, intestinal obstruction is the most common complication, with incidence rates varying from 22 to 50% [7].

MD complications become clinically apparent in up to 16–20% patients with this condition [1, 8]. Symptomatic diverticula are more common in males than in females, despite the fact that there is no known gender predisposition of asymptomatic MD [3], and the incidence of complications decreases with age, with the majority occurring in the pediatric population [9].

Case Report

A 49-year-old Caucasian male attended the emergency department because of right abdominal pain, fever, and constipation during the past 5 days. He also reported increasing symptoms during the last day. The patient had no significant medical history.

Physical examination detected significant tenderness on palpation of his right iliac fossa, with signs of localized peritonitis, including involuntary guarding and rebound tenderness. Auricular temperature was 37.5°C. Laboratory data revealed C-reactive protein serum level of 306 mg/L (normal range, <5.0 mg/L) and leukocytosis (24,000/μL [normal range, 4,500–11,000/μL]).

Abdominal X-ray and abdominal ultrasound showed no significant alterations, with no signs of acute appendicitis. In this case of acute abdomen, without an evident cause, an abdominal/pelvic computed tomography (CT) scan with intravenous contrast was performed, and a tubular blind-ending structure arising from the terminal ileum, measuring 65 × 25 mm (longitudinal and transverse diameter, respectively), was demonstrated. It was associated

with a thickened and hypercaptant distal ileum, with intramural bowel gas as well as foci of adjacent extraluminal gas. A surrounding fat stranding was also detected (Fig. 1). No significant lymphadenopathy could be appreciated. The rest of the abdomen, including the appendix, was unremarkable. In conclusion, contrast-enhanced CT features were highly suggestive of a perforated MD.

Based on imaging findings in association with worsening general condition, an emergency laparotomy intervention was performed and perforated Meckel's diverticulitis was confirmed, along with an extensive inflammatory mass (abscess) with ileal, ascending colon, and abdominal wall involvement. Therefore, the patient was submitted to a right hemicolectomy and segmental enterectomy, with an ileocolostomy. Histological examination revealed an MD, measuring about 80 × 35 mm, with perforation of its distal portion with contiguous abscess. There was no evidence of ectopic tissues in the MD (Fig. 2). The patient recovered well after surgery and completed 8 days of antibiotic therapy.

Discussion

The majority of MD cases remain clinically silent during the entire lifetime, and their presence may be discovered incidentally during surgery, autopsy, or when performing small gastrointestinal studies [10, 11]. On CT, MD may appear as a fluid- or air-filled blind-ending pouch that arises from the antimesenteric side of the distal ileum. However, CT has a low sensitivity for the detection of uncomplicated MD because its appearance mimics that of a normal bowel loop. Complicated MD represents an important cause of acute abdominal pain [12, 13], and most cases with inflamed MD may be visualized on CT.

The diverticulum is considered complicated if it is the site of bowel obstruction or if it presents surrounding features of infiltration or inflammation, signs of perforation, adjacent fluid collection, or active bleeding. Depending on the type of complication, the diverticulum may have surrounding mesenteric inflammatory changes or may look like a localized fluid or air-fluid collection, with normal aspect of the small bowel proximal and distal to the diverticular inflammation [3]. However, less than 10% of symptomatic MD is diagnosed preoperatively [5].

The most common presentation associated with symptomatic or complicated MD is bleeding, followed by intestinal obstruction, diverticulitis, intussusceptions, and neoplasm [14]. Perforation is noted to be an occasional consequence of acute Meckel's diverticulitis, but the exact rate of this has not been reported [15].

There are a few studies described in this particular complication in adults, and they are not consensual: According to a study by Kusumoto et al. [16], in a review

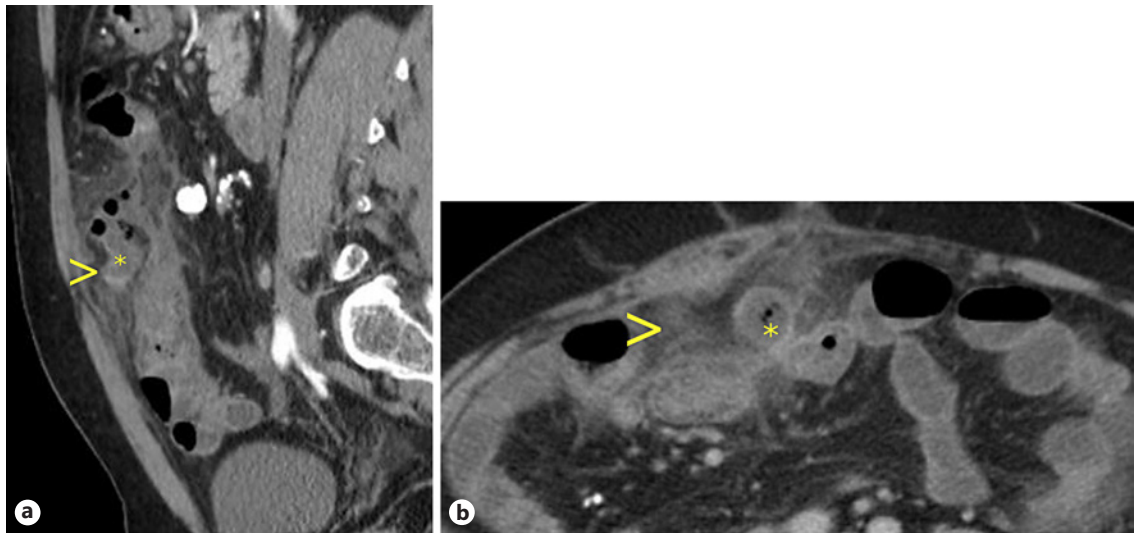


Fig. 1. **a** Sagittal enhanced CT images showing a tubular blind-ending structure (asterisk) measuring 65 mm (longitudinal diameter), with a thickened and hypercapant wall (arrowhead). **b** Axial contrast-enhanced CT showing a rounded structure (asterisk). There is also densification of contiguous fat planes along with free fluid suggesting inflammatory process (arrowhead).

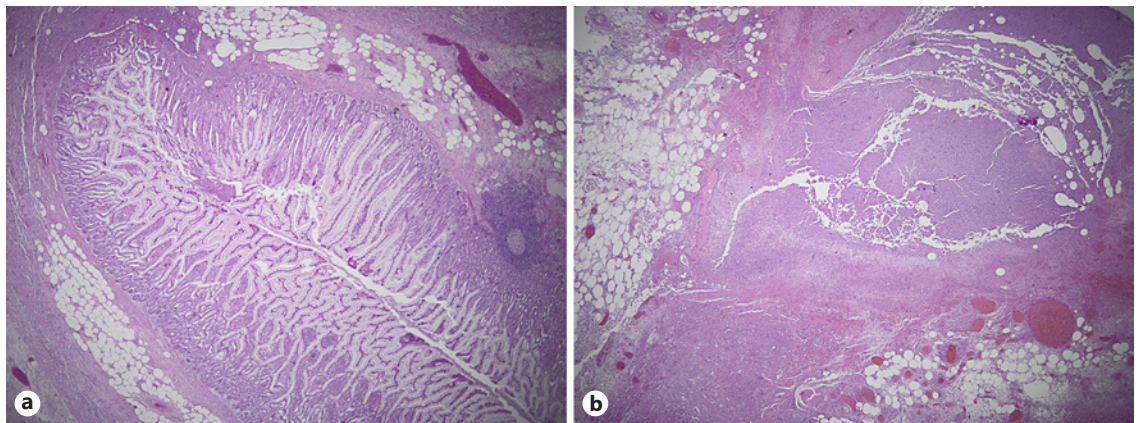


Fig. 2. Surgical resection specimen. **a, b** MD with intestinal mucosa without ectopic tissue evidence. Perforation of its distal portion with contiguous abscess was observed (H&E, $\times 20$).

of 776 Japanese patients, it has been reported that perforation accounted for 10.8% (84 of 776) of complications associated with the MD. According to Chae et al. [7], perforation is rarely seen and was reported as being responsible for 0.5% of symptomatic diverticulum. Another study (composed of 12 men and 11 women, with a mean age of 42.6 years, over a 15-year period) concluded that diverticulum-related complications demonstrated by surgery were inflammation in 14 patients, bleeding in 5 patients, intestinal obstruction in 3 pa-

tients, and penetrating foreign body causing perforation in 1 patient [3].

MD perforation is a serious and often life-threatening complication, usually secondary to diverticulitis, gangrene, or peptic ulceration due to ectopic gastric mucosa. Other various pathologies leading to perforation are Littre's hernia and tumors such as leiomyosarcoma, lymphatic sarcoma, and poorly differentiated stromal tumor [17]. Perforation of MD by foreign bodies is extremely rare, and in a review, the indication rate for a resection

due to perforation by foreign body was reported to be 8% of all complicated diverticula [18].

However, a symptomatic or complicated MD diagnosis is difficult to confirm on the basis of history, physical examination, laboratory findings, and imaging, because a variety of conditions can mimic the MD both clinically and radiologically (such as appendicitis, ileal/colonic diverticulitis, or regional enteritis/colitis) [19].

Traditionally, clinicians, when confronted with a patient with complicated MD, relied on conventional gastrointestinal contrast studies, angiography, or scintigraphy. However, these methods have been progressively replaced by CT scan, which is now routinely used as the first-line imaging tool in the diagnostic workup of the acute abdomen [20]. The sensitivity of diagnosing the MD on CT scan has increased owing to the availability of higher spatial resolution and multiplanar isotropic reconstruction ability of the latest MDCT scanners, which allow visualization of the small bowel in various planes [21].

Other techniques, including conventional radiographic examination, are of limited value and usually unrevealing. However, it may show enteroliths, findings of bowel obstruction, and the presence of gas or a gas-fluid level in the diverticulum [22]. Although of limited value, sonography has been used for the investigation of MD [23]. High-resolution sonography usually shows a fluid-filled structure in the right lower quadrant having the appearance of a blind-ending, thick-walled loop of bowel, with the typical gut signature and a clear connection to a peristaltic, normal small-bowel loop [21]. Scintigraphy with ^{99m}Tc-Na-pertechnetate has only minor diagnostic value and a limited sensitivity of 60% in diagnosing MD [24]. However, it aids in the diagnosis of diverticula with ectopic gastric mucosa. Pertechnetate is taken up by mucin-secreting cells of the gastric mucosa and ectopic gastric tissue. Higher sensitivity in pediatric (85–90%) than in adult (60%) patients is noticed [24]. This could be due to earlier symptoms (such as hemorrhage) in patients with ectopic gastric mucosa.

There is no consensus in the literature on the management of MD complications. In one study, the authors suggested four features associated with symptomatic diverticula – age <50 years, male sex, diverticulum length >2 cm, and the presence of ectopic or abnormal features within the diverticulum – and recommended that the presence of any of these four criteria should warrant removal of the MD [1]. Surgical removal of an MD is the current management of choice in a patient symptomatic for an MD or for any of its complications. However, the

controversy surrounding surgical removal of an incidentally detected MD still continues today [1]. This article highlights the importance of CT in the evaluation of MD complications because in the case of diverticulitis and perforation, inflammatory changes and extraluminal air may be present and can be easily identified on CT scan.

In conclusion, if an inflammatory process is visualized on CT in the lower abdomen or pelvis, particularly at midline, or if there is evidence of distal small-bowel obstruction, one should carefully search for the presence of a complicated diverticulum. If a normal appendix is identified, the likelihood of this diagnosis increases [25]. MD complications can present with a wide range of clinical and imaging manifestations, from benign indolent findings to acute life-threatening conditions [21]. CT findings of complicated MD are very polymorphic and should be remembered in the evaluation of adult patients with acute abdomen [8].

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Statement of Ethics

The authors have no ethical conflicts to disclose.

Disclosure Statement

The authors have no conflicts of interest to declare.

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