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Spontaneous Perforation of Meckel's Diverticulum Presenting as a Rare Cause of Acute Abdomen: A Case Report

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ABSTRACT

Meckel's diverticulum (MD) is the most common congenital abnormality of the gastrointestinal tract, most likely to be found at the antimesenteric side of the distal ileum. The majority of patients remain asymptomatic however symptoms such as obstruction, perforation, inflammation and gastrointestinal hemorrhage can occur due to complications, which have an extensive variety of clinical and imaging manifestations. Accordingly, it is important to consider Meckel's diverticulum as a differential diagnosis in patients presenting with acute abdomen. The treatment of complicated MD is surgery but there is no clear recommendation yet for incidentally detected cases.

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Introduction

Meckel's diverticulum is a congenital abnormality originally described by Johann Friedrick Meckel in 1809 as an embryological phenomena which results from the persistence of the vitelline duct [1]. The diverticulum arises in most cases from the antimesenteric border of the ileum, near the ileocecal valve, and its structure includes all small intestine layers, besides having its own blood supply [2]. Around 60% of DM is composed of heterotopic mucosa, of which over 60% consist of gastric mucosa, and in most cases this heterotopic tissue subsequently causes complications such as inflammation, spontaneous perforation or bleeding [3]. Among the complications, gastrointestinal bleeding and obstruction stand out in pediatric patients while obstruction can be mostly found in adults [2,4]. It is important to highlight that MD inflammation or perforation can mimic acute appendicitis because, although not specific, common symptoms of DM involve vomiting, high fever and abdominal pain [5]. However, according to the complication, clinical manifestation may vary.

Case Report

A 38-year-old man seeks emergency care with abdominal pain in the right iliac fossa for 2 days, accompanied by fever that has not been measured, and stoppage of gas and stool elimination during this period. He reported that the abdominal pain had progressively worsened in the last hours. He had one episode of vomiting without improvement of the pain. He denied any previous pathological history or intestinal alterations.

On physical examination the patient was prostrated with signs of toxemia with tachycardia (heart rate of 122 beats per minute) and tachypnea (respiratory rate of 22 breaths per minute).

He presented significant abdominal pain on superficial and deep abdominal palpation with signs of sudden positive decompression throughout the abdomen. The initial laboratory tests showed leukocytosis (16,300 cells/mm3) and C-reactive protein of 162 ng/mL and other laboratory tests without changes.

The simple abdominal radiography in 3 views showed signs of pneumoperitoneum, and surgical treatment was promptly indicated due to the diagnosis of acute perforative abdomen.

The patient was submitted to exploratory laparotomy with identification of a small amount of purulent liquid between the delgado loops (approximately 200 mL) and a normal cecal appendix. An inventory of the cavity demonstrated the presence of a 3 cm Meckel's diverticulum situated 55 cm from the ileocecal valve with hyperemia and signs of perforation at the lateral portion of the diverticulum with leakage of enteric contents into the abdominal cavity.

We opted for segmental enterectomy encompassing the Meckel's diverticulum in a monoblock with the surgical specimen, which resulted in an enterectomy of approximately 7 cm, and an entero-enteroanastomosis performed with a 3 cm diameter standard blue-loaded linear stapler.

The patient remained hospitalized for 5 days receiving intravenous antibiotic therapy (ceftriaxone and metronidazole) indicated by the internal infection commission, evolving satisfactorily and was discharged asymptomatic from the abdominal point of view.

The anatomopathological exam showed a 6.8 cm segment of small bowel with a diverticular structure with mucosa containing pancreatic tissue without atypia and reactive fibrosis with clear loss of continuity solution of the diverticular wall with fibrin and neutrophil deposition associated with liquefaction necrosis.

The patient was followed up for 3 months without any intercurrence related to the surgical procedure or postoperative complications.

Discussion

As the gastrointestinal tract evolves in fetal development, the midgut is initially connected to the vitelline sac through the vitelline or omphalomesenteric duct. Posteriorly, the omphalomesenteric duct narrows and locates inside the umbilical cord. Nearly the 10th week, the omphalomesenteric duct normally obliterates and the intestine is freely contained in the peritoneal cavity. Accordingly, the Meckel Diverticulum (MD), firstly described in 1809 by Johann Friedrick Meckel, occurs when the intestinal extremity of the omphalomesenteric duct persists, being classified as a true intestinal diverticulum, once involves the evagination of all intestinal wall layers (mucosa, submucosa, muscularis externa and serosa) and, consequently, has its own blood supply (a branch of the superior mesenteric artery) [6,7].

Commonly, gastrointestinal malformations correspond to approximately 6% of all congenital malformations [6]. MD features are generally quoted by the "rule of 2s" by some authors: is the most common congenital gastrointestinal anomaly, generally found in approximately 2% of the population, twice more likely in males, often found in children at the age of 2 or less, usually located within 2 feet (approximately 60cm) from the ileocecal valve at the antimesenteric border of the ileum (rarely on the mesenteric side), 2 inches (approximately 5 cm) long and may contain 2 types of ectopic mucosas (gastric, mainly, and pancreatic) [8,9]. However, despite the general facts previously presented, based on a recent systematic review, MD is on average 52 cm from the ileocecal valve, 3.05 cm in length and 1.58 cm in diameter [8].

The majority of patients remain asymptomatic and MD's presence may only be incidentally discovered during gastrointestinal studies or intraoperatively, through a laparoscopy or laparotomy indicated by the suspicion of other pathologies. However, the symptomatic presentation may occur throughout life, caused by a complication and presenting as a rare cause of acute abdomen with symptoms varying according to the complication.

Although Meckel´s statements claim a 25% complication rate, other authors have concluded that such rate is overestimated [10]. In general, Zani et al. stated a 4.2% rate of lifetime risk of complications due to MD, while Cullen et al. reported the lifetime risk at 6.4% [8,11,12]. Nevertheless, based on a study including 202 patients, the incidence of complications decreases with age and the pediatric population is at the higher risk: 4% risk in patients younger than 20, 2% risk in patients younger than 40 and 0% risk in the elderly [7,13,14]. There are four criterias that predicts the complication of an asymptomatic incidental MD, accordingly to a retrospective study: diverticulum longer than 2 cm (17%), male gender (25%), younger than 50 years of age (42%) and presence of ectopic tissue (70%) [4,8]. Those complications include obstruction, inflammation (diverticulitis), bleeding and perforation and, overall, while intestinal hemorrhage and obstruction are most common in pediatric patients, obstruction can be the main complication in adults, with incidence rates varying from 22 to 50% [4].

Obstruction is characterized as a result of occlusion of the diverticulum's lumen, which occurs when MD is complicated by adhesions, intussusception, formation of enteroliths, internal hernias, volvulus, neoplasm, parasites or foreign body. Clinical presentation includes abdominais pain, constipation, vomiting and can evolve with inflammation or necrosis if not corrected within tolerable time [6]. Other complications can be related to the presence of abnormal ectopic mucosa which can be found in 60 of cases [6]. Gastric ectopic tissue can evolve with mild or moderate gastritis and subsequent inflammation, hemorrhage or perforation [1,6]. Meanwhile pancreatic ectopic tissue can lead to inflammation or obstruction due to the formation of nodules at the bottom of the diverticulum [6]. The association of bleeding with the ulceration of ectopic pancreatic mucosa is more unlikely: 5% compared to a 60-65% rate of gastric mucosa ulceration [6]. In case the patient presents acute diverticulitis, whether as a consequence of obstruction or ectopic tissue ulceration, symptoms such as tenderness and acute generalized abdominal pain that shifts to the right iliac fossa can occur. Apart from nonspecific they also mimic other acute abdominal conditions. On this occasion, the main differential diagnosis is acute appendicitis [8,15]. However, accordingly to a study, if there is a delay in pain reallocation there is a higher suspicion of a complicated MD [13]. Finally, perforation is the rarest complication and it is usually secondary to diverticulitis, gangrene, ulceration and, less commonly, by trauma or foreign body [4,16]. Symptoms can also mimic other acute abdominal conditions such as acute appendicitis, which should be considered as a differential diagnosis [16].

All things considered, apart from incidental cases of MD found intraoperatively, preoperative accurate diagnosis of a complicated MD is notably difficult as clinical and imaging features can overlap other acute abdomen disorders, especially when presented at a non "classical" location such as the mesenteric border [2,11]. Have that said, some complementary imaging exams can be useful when a high index of suspicion is presented [6], even though it has only been achieved in less than 10% of cases [4].

Conventional radiographs are, in general, nonspecific and have limited value [6]. In case MD is perforated, pneumoperitoneum is often unremarkable, however, it may be elusive in case there is an obstruction, demonstrating characteristic findings or enteroliths, for instance [4,6,12]. Sonography can be a good method to evaluate intussusception, obstruction (evidence of a tubular distended structure) and, mostly, inflammatory process, in which case findings can be quite similar to acute appendicitis [6]. CT scan, in turn, is the most commonly used imaging method in the diagnostic workup of acute abdomen [4,18]. Despite the increased sensitivity of MD diagnosis due to higher spatial resolution and multislice images which can be reconstructed, an uncomplicated MD is difficult to visualize since its appearance mimics a normal bowel loop [4,17,18], but findings as a fluid- or air-filled tubular structure with blind-ending that arises from the antimesenteric side of the distal ileum can suggest its presence [5,14].

If CT scan shows inflammation in the hypogastrium, particularly at midline, or right iliac fossa or if distal small-bowel obstruction is suspected, complicated MD should be considered as a differential diagnosis, mainly if normal appendix is identified [1,4]. Another resource available and considered the gold standard by many

authors is technetium-99m pertechnetate, one of the most accurate, non-invasive diagnostic technique, but it present as a false negatives as the heterotopic gastric mucosa must be present for a positive result [6]. Finally, another possibility both in diagnosis and treatment is laparoscopy. This method has its value especially in case of CT scan limitations and high diagnostic suspicion, once late diagnosis increases life threatening outcome [15].

The conduct towards the diagnosis depends on whether the diagnosis was symptomatic or incidental. The recommended treatment of symptomatic/complicated MD is surgery. The diverticulum can be removed either via laparoscopy or laparotomy, both approaches with equally satisfying results. The main difference between these two techniques is that numerous studies have demonstrated relatively low early and late postoperative complications and early recovery in the first one [13]. Regarding the MD approach, simple diverticulectomy can be performed when there is no adjacent loop involvement. On the other hand, segmental enterectomy with thermo-terminal anastomosis is preferred in case of bleeding, diverticulitis and when associated neoplasia is suspected [6]. It is also important to mention that a complete resection of ectopic tissue is essential to minimize the risk of recurrent symptoms, as, as mentioned above, it can lead to the majority of complications [12].

There is no standard treatment recommendation yet for incidentally detected cases and there is a controversy surrounding the surgical removal of the MD. Initially, some papers such as Soltero's and Bill's used to recommend MD's prophylactic resection only in pediatric patients, due to its higher risk of becoming symptomatic [10]. Currently, some authors argue in favor of diverticulectomy in asymptomatic patients either MD is a preoperatively finding or in case the patient is undergoing surgery for any other reason due to its potential propensity to evolve with a complication in the future, as long as there are no further risk factors, in which case the risks of MD removal overcomes its benefits [1,6]. Other authors, on the contrary, stand up for an expectant conduct in asymptomatic patients, especially elderly ones, since the rate of complications decreases with age and is insignificant in this age group and there are higher risks in the surgical procedure [6].

Conclusion

Spontaneous perforation is a very rare complication of Meckel's diverticulum, especially in elderlies. The symptoms may mimic other acute abdominal conditions and should be considered a differential diagnosis particularly for appendicitis. Therefore an accurate clinical suspicion is required and the computed tomography is also an appropriate radiological method to evaluate complicated Meckel's diverticulum and guide its management [19].

Research Ethics Committee Approval: We declare that the patient approved thestudy by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

Conflict of Interest: we have no conflict of interest

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