Meckel's diverticulum: sometimes a hidden pitfall

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Keywords

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Abstract

Meckel's diverticulum is the most common congenital abnormality of the small intestine, resulting from incomplete obliteration of the vitelline duct leading to the formation of a true diverticulum. The clinical presentation ranges from an asymptomatic course up to life-threatening complications. We report the case of a 3-years-old boy, initially diagnosed with an acute gastritis. Additional diagnostics showed the need for urgent surgical treatment due to a small bowel obstruction. This case report addresses the importance of adding additional diagnostics if the patient is not clearing up within acceptable time with the initiated therapy.

Introduction

Meckel's diverticulum (MD) is a common congenital true diverticulum on the ileum, resulting from incomplete atrophy of the vitelline duct (1). This vitelline duct contains pluripotent cells, which can give rise to heterotopic tissues (if the duct does not disappear), of which gastric mucosa is the most common, followed by pancreatic and rarely colonic and biliary mucosa. The acid secretion of the ectopic gastric tissue causes tissue changes in the adjacent mucosa (erosion and ulceration), which are accountable for the main pathological reason behind complications (2). Various complications can arise in the form of intestinal obstruction, hemorrhage, diverticulitis, perforation and rarely vesicodiverticular fistulae and tumors. We report a case of intestinal volvulus with strangulation, caused by a fibrovascular band arising from MD. The aim of this article is to highlight the clinical index of suspicion leading to this diagnosis, the possible additional examinations and suggested management.

Case report

A 3-year-old boy presented to the emergency department because of non-bilious vomiting up to 10 times and severe anorexia since one day. At presentation there were no complaints of abdominal pain.

His personal history was uneventful and there was no history of previous abdominal surgery.

Clinically, the boy was pale with sunken eyes and dry lips. On examination, a hyperperistaltic non-distended abdomen without guarding, tenderness or masses was found. Furthermore, no clinical abnormalities were found. Laboratory findings showed a leukocyte count of 16.90 (5-15x109/l), a CRP value of <1 (<5mg/l) and electrolytes and hemoglobin within normal limits. He was diagnosed with an acute gastritis, for which he was hospitalized, and intravenous fluid treatment was started.

A few hours later, given insufficient recovery on intravenous fluid with emerging pain, further diagnostics were initiated. He remained afebrile. Abdominal ultrasound showed an increased amount of intra-abdominal free fluid and distended small bowel loops filled with fluid. To identify the cause, computerized tomographic imaging (Figure 1) was performed which revealed the whirlpool sign, a rotation of the bowel around its mesentery leading to whirls of the mesenteric vessels, with striking dilatation of small bowel loops and a collapse of ileal intestinal loops (3). Laboratory findings showed a leukocyte count of 31.5 (5-15x109/l), a CRP value of 45 (<5 mg/l) and a hyponatremic (sodium 133 (135-145 mmol/l)) metabolic acidosis (HCO3- 16.7 (22-29 mmol/l)). Blood gas showed an elevated lactate level of 18 (<11.3 g/dl).

In dialogue with the surgery department, the decision was made to perform an emergency exploratory laparotomy under general anesthesia. In entering the peritoneal cavity, a mesodiverticular fibrovascular band, extending between the tip of MD and the visceral peritoneum of the small bowel mesentery, was seen. This fibrovascular cord caused independently prominent stenosis of the terminal ileum, which resulted in an intestinal volvulus causing obstruction and strangulation. The fibrovascular band was cut and the diverticulum resected. The compromised intestinal loop gradually recolored with marked pulsations and capillary refill (Figure 2). No segmental bowel resection was necessary.

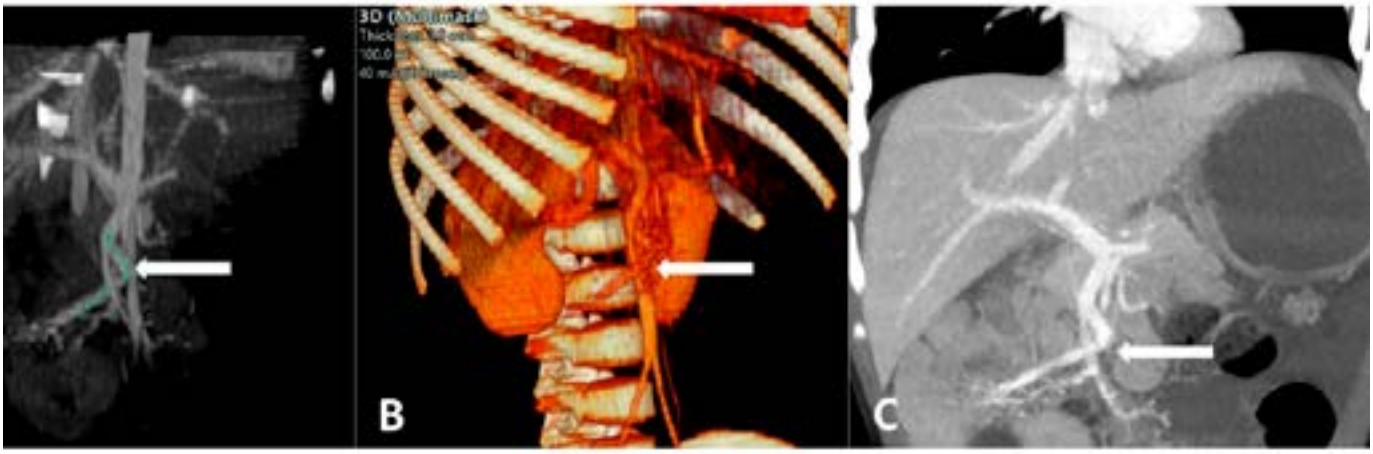
The diverticulum was sent for histological examination. No heterotopic tissue was found, but the image is compatible with a MD. Early ischemic changes were already noticed. Postoperative antibiotic therapy (piperacillin/tazocin) was initiated. The patient recovered without any complication and was discharged one week later.

Discussion

It has been stated that MD follows the 'rule of 2s', as it occurs in 2% of the population, is usually discovered before 2 years of age, is situated within 2 feet (61cm) of ileocecal valve, measures 2 inches (5cm) in length and 2cm in diameter (2).

The life-time risk of diverticulum complications is approximately 4-9% (1). This embryologic remnant may cause different kinds of complications. Combining the largest pediatric patient series, 46.7% of children presents with obstruction,25.3% presents with gastro-intestinal-hemorrhage and 19.5% presents with inflammation (4). Rarer forms of symptomatic MD, including umbilical abnormalities involving the vitelline duct, parasite-infections, Meckelian cancers and uncertain cases, account for the remainder (1). Studies agree there are more men than women presenting with symptomatic MD and that the most common presentations of symptomatic MD are caused by obstruction, gastro-intestinal hemorrhage, and inflammation with or without perforation. Ectopic gastric tissue is associated with symptomatic MD in general and with gastro-intestinal hemorrhage in particular (1,5). Complications are frequently associated with younger ages, as 40% of these complications are seen below the age of ten years (2). An explanation why symptomatic MD presents more often in young patients, comes from the decrease in nerve fiber density with age. Higher nerve fiber density leads to more intense local peristalsis which may cause intussusception.

Figure 1 (Panel A-C) : Radiological images of the abdomen with visualization of the mesenteric swirl sign (arrows).



In contrast, acid production in ectopic mucosae increases with age, which could explain why children with hemorrhage are older (1).

Obstruction caused by the MD, can be caused by different mechanisms. In children, volvulus and intussusception appear to be the most common etiologies (1). In our case a fibrovascular cord was the cause of the intestinal volvulus. It is an extremely rare condition; we found only nine cases reported before this one (6). It is believed that the connection between the mesodiverticular band and adjacent mesentery establishes an axis for diverticular torsion and an opening for bowel to herniate, thus propagating the important mechanism for this pathology (7).Other mechanisms are torsion of the diverticulum (8), a Meckel's diverticulitis which results in reduced intestinal luminal diameter, an inversion of MD into the bowel lumen or an incarceration of the MD in an abdominal wall of internal hernia (2). This latter complication is also reported as a cause of sudden infant death syndrome (9).

Common symptoms of MD complications are fever, vomiting, abdominal pain and bloody stools. These symptoms and its underlying pathological processes are not unique to MD. MD represent a diagnostic challenge and are often incidentally found (1,2).

MD can be diagnosed by using imaging modalities as ultrasound, angiography, scintigraphy (Tc-99m), CT and MRI. When observed on ultrasound and CT, the MD takes the shape of a cyst or blind pouch diverging from the ileum. Angiography may identify the source of gastro-intestinal hemorrhage and the vitelline artery branching off the superior mesenteric artery, when present, is pathognomonic for MD. Nuclear scans with Tc-99m visualize the MD by accumulation of the tracer in the ectopic gastric tissue. The sensitivity and specificity of most of the diagnostic test is low and one needs to actively search for it (1). However, complications are easily diagnosed and can lead to indispensable surgical interventions. In a study of Kawamoto and all, a MD was detected on CT in 57.1% of symptomatic patients (10). Nuclear scans with Tc-99m visualize the MD by accumulation of the tracer in the ectopic gastric tissue and have a respectively sensitivity and specificity of respectively 89.6% and 97.1% (1).

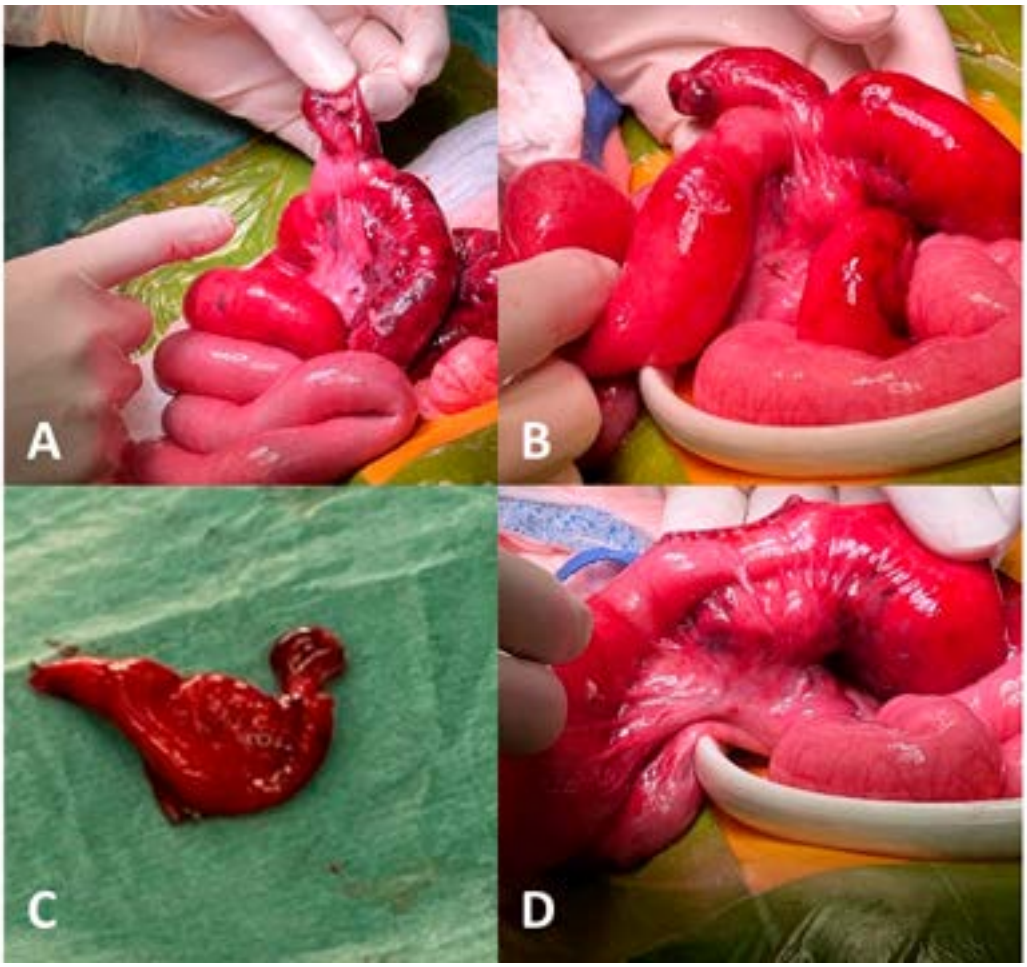
Symptomatic MD should be managed surgically by performing a diverticulectomy using hand-sewn or stapling techniques through an open or laparoscopic approach (11). A laparoscopic approach is feasible and safe and a review of the national Surgical Quality Improvement Program-Pediatric (NSQIP-Ped) database confirmed that the laparoscopic approach is associated with a shorter length of hospitalization. If a conversion from a laparoscopic to an open procedure is required, the risk of complication is not affected (12). Diverticulectomy is most easily performed using a linear gastrointestinal stapler applied to the base of the diverticulum (13). A segmental resection is suggested if the small bowel lumen is in jeopardy of being narrowed, a palpable abnormality is present at the base of the diverticulum, the neck of the diverticulum is wide (>2 cm) or if the diverticulum is short, broad-based with features warranting resection due to the risk of leaving behind ectopic tissue at the base (11). When gastrointestinal bleeding is the primary clinical manifestation, it is likely that both segmental small bowel resection and simple diverticulectomy are effective surgical approaches (14,15,16).

As illustrated in our case, a MD can mimic other abdominal diseases such as an appendicitis gastro-enteritis or an intussusception (17). If the patient does not respond as expected to the initiated therapy for the presumptive diagnosis, other differential diagnoses, among which a MD, should be considered.

Conclusion

MD can present itself in a broad clinical spectrum, ranging from an asymptomatic course up to life-threatening complications for which a high suspicion for timely diagnosis and surgical intervention should be kept. In our case, the diagnosis of a MD with intestinal volvulus and strangulation was made within 24 hours after presentation, without any complication, even with non-suspicious clinical examination and normal blood analysis with presentation. Take home message: as pediatricians we are familiar with the common presentation of a gastritis and its treatment. However, if the patient is not clearing up within acceptable time frame after correctly initiated standard therapies, the patient should be reassessed, and additional diagnostics should be promptly added.

Figure 2 (Panel A-B) : On the series of photo's, the strangulation by the fibrovascular band resulting in a cyanotic ileal segment can be seen. A diverticulectomy was performed with a linear gastro-intestinal stapler at the base of the diverticulum. The ileal segment recovers with good capillary refill and pulsations.



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