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Rare Variant of Meckel's Diverticulum on the Mesenteric Border Complicated by Perforation: Case Report and Literature Review

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Abstract

Background: Meckle's Diverticulum (MD) is a remnant of vitello intestinal duct found in approximately 2-4% of normal population and is usually located on the anti-mesenteric border of terminal ileum. Its variant, the mesenteric type is even rarer, with only a few cases reported in literature.

Case: We describe a case of inflamed mesenteric MD that presented with clinical findings of acute appendicitis, but, upon exploration, was diagnosed as inflamed mesenteric MD, that was removed, and the patient recovered without any complications and went home in good condition. We also review all the mesenteric MD cases reported in the literature since 1941.

Conclusion: MD is a rare operative finding, but knowledge of its rare variant must be kept in mind as the signs and symptoms closely resemble acute appendicitis.

Keywords: Meckle's diverticulum; Mesenteric Meckle's diverticulum; Acute abdomen

Introduction

Meckle's Diverticulum (MD) is a remnant of vitello-intestinal duct, located on the anti-mesenteric border of the terminal ileum, found in 2% of patients. Its inflammation resembles acute appendicitis and is frequently included in the differential diagnosis of later condition. The presence of MD on the mesenteric side is a rare occurrence and very few cases have been reported in the literature. We report a case of mesenteric MD with review and its management.

Case Report

A 26-year-old, healthy female presented to the emergency room of our institution (Hamad General Hospital, Doha, Qatar) complaining of 4-day history of dull aching pain in right iliac region associated with nausea and anorexia. She had no history of shifting of pain, vomiting, fever or change in bowel habits. There was no significant history or any co-morbid conditions. Upon examination, her general condition was good; she was afebrile, and vital signs were with normal limits. Abdominal examination revealed tenderness and localized guarding in right iliac fossa. There was no rebound tenderness [1,2].

Laboratory investigations showed total leukocyte count of 9,100/µL, and the rest of the investigations were normal. Ultrasonography of the abdomen showed a picture of perforated acute appendicitis with small fluid collection in right iliac region [3-5].

Fluid resuscitation and antibiotics were started in the emergency room, laparoscopic exploration revealed no peritoneal collection, and the appendix appeared healthy. However, on tracing the bowel, a mass was discovered about 40 cm from ileocecal junction but was not obstructing the lumen of ileum. Dissection of the mass was difficult as the small bowel was adherent and inflamed (Figure 1), hence midline laparotomy was undertaken, and the mass was dissected. It showed a perforated narrow-based diverticulum that was arising from the mesenteric border of the ileum (Figure 2). The diverticulum was excised using a stapler and

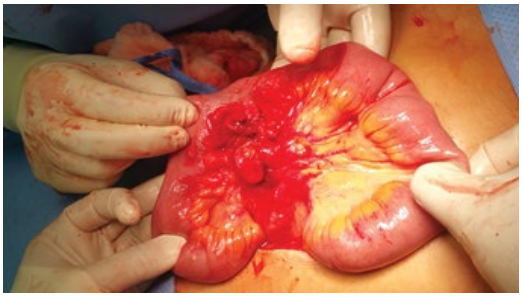

Figure 1: Perforated mass on mesenteric side.

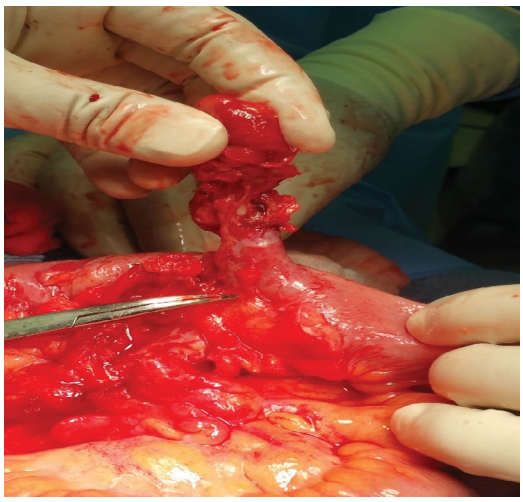

Figure 2: Perforated inflamed diverticulum on mesenteric side after dissection.

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No	Author/yr	Patients (N)	Sex	Age (Yrs)	Presentation	Pre-op diagnosis	Procedure	Operative finding	Dimension (cm)	Separate blood supply	Distance from ICV (cm)	Histopathology
1	Current case	1	F	26	RLQ pain	Acute appendicitis	Diverticuloectomy	Perforated narrow based diverticulum arising from mesenteric end	5 × 2.5 × 1	No	40	MD with Diverticulitis
2	Toure et al., 2015	1	M	45	epigastric pain	Acute abdomen	Segmental resection+anastomosis	a perforated Meckel's diverticulum of 3.5 cm in size	3.5	--	40	Perforated diverticulitis without heterotopic tissue
3	Mohanty et al., 2014	1	M	16 m	Bleeding per rectum	Bleeding MD	Small bowel resection+anastomosis	Diverticulum on the mesenteric border of the ileum	--	--	60	Antral type gastric mucosa showing chronic peptic ulceration apart from intestinal mucosa
4	Ahmed et al., 2014	1	M	25	R LQ pain	Small bowel mass	Segmental resection+anastomosis	Mesenteric mass	--	--	44	Chronic inflammation of MD, no heterotopic tissue
5	Singh 2013	3	--	2	Serous discharge from umbilicus	--	Small bowel resection +anastomosis	Mesenteric diverticulum	1.5 × 1	--	40	Absent gastric mucosa
			--	3	Painless rectal bleeding	--	Small bowel resection+anastomosis	Mesenteric diverticulum	2 × 1	--	30	Ectopic gastric mucosa
			--	2	Umbilical pain	--	Small bowel resection+anastomosis	Mesenteric diverticulum	1.5 × 1	--	30	Ectopic gastric mucosa
6	Carpenter et al., 2013*	1	M	35	Black stool	MD	Exploratory laparoscopy with small bowel resection+side-to-side anastomosis	Mesenteric diverticulum	7 × 2.5	--	60	Ectopic gastric mucosa
7	Karaman et al., 2012	1	M	23	RLQ pain	--	Appendectomy+diverticulectomy	Inflamed head of MD	9 × 1	--	70	Acute appendicitis with MD with a thin muscular layer
8	Seitun et al., 2011*	1	F	65	RLQ pain	MD	Appendectomy+diverticulectomy	Inflammatory changes of distal ileum and diverticulum+mesenteric abscess	4 × 2.7 × 2.5	--	40	Severe acute transmural phlegmonous inflammation; focal area of heterotopic gastric mucosa (6 mm in length) within the head of the diverticulum with perforation+localized peritonitis +severe perivisceral inflammation
9	WalczaK et al., 2011	1	M	25	Incidental on US	Hypogastric/ mesenteric cyst	Small bowel resection with end to end anastomosis	Mesenteric cyst, adherent	10 × 6	No	60	Ectopic gastric mucosa+inflammatory changes
10	Manukyan et al., 2009*	1	F	15	Abdominal pain	Acute abdomen	Ileal segmental resection	Perforated mesentric diverticulum and pus and intestinal content in pelvis, normal appendix	5 × 4 × 4	--	90	Pancreatic tissue+oxyntic and antral type gastric mucosa
11	Buke et al., 2008*	1	M	8 m	Painless rectal bleeding	MD	Segmental resection with anastomosis	Inflamed diverticulum and lymphadenopathy	2 (base)	No	40	Heterotopic gastric mucosa
12	Segal et al., 2004*	1	M	19	Diffuse abdominal pain	Acute appendicitis	Small bowel resection+wide local excision of mesentery+appendectomy	Mesentric mass, mesenteric thickening, adenopathy	4 × 3.5	No	63.5	Ectopic gastric mucosa+inflammatory changes

m: months; M: Male; F: Female; US: Ultrasonography; MD: Meckle's Diverticulum; RLQ: Right Lower Quadrant; * as reported by Carpenter et al., 2013

Table 1: Review of reported Mesenteric-sided Meckle's diverticulum cases in the literature (1941-2016).

the intestine closed with PDS sutures. Histopathology of the specimen confirmed a diverticular pouch with inflammation (5 × 2.5 × 1 cm). The post-operative period was uneventful, and she was discharged on the third day.

Discussion

Meckel's Diverticulum is a congenital gastrointestinal tract malformation mostly in pediatric population but also seen in adults. The incidence ranges between 2-4%. It is a true diverticulum with five wall layers and independent blood supply from superior mesenteric artery. The diverticulum represents a persistent remnant of the omphalomesenteric duct, which connects the midgut to the yolk sac in the fetus. Its involutes during the fifth and sixth weeks of gestation as the bowel settles into its permanent position within the abdominal cavity.

The criteria that define MD include: its antimesenteric location, containing all 5 layers, and separate blood supply (remnant duct or mesodivertciular band) (Jay), although 10% of all cases have the vitelline artery [6]. A rule of 2 characterizes MD: 2 inches long, 2 feet away from ileocecal valve, 2% of population are affected, 2 types of common ectopic mucosa are present (gastric and pancreatic), 2 years is the most common age of presentation, and 2:1 male to female ratio. Nevertheless, some have reported that MD is equal in both genders [7], or with male predominance [8] and that complicated cases are 3-4 times more common in males [9]. About 90% of the diverticula are within 90 cm of the ileocecal valve, although it has been reported once to be 180 cm from the ileocecal valve [10-14].

MD is discovered incidentally during surgery for other pathology, in diagnostic imaging, or when patients present with complicated MD, with the lifetime risk of MD developing a complication is 4-6% [15]. The most common clinical and histopathological features of symptomatic MD are age younger (<50 years), gender (male), diverticulum length (>2 cm), and presence of ectopic tissue within the diverticulum [5]. The most common complications include hemorrhage, obstruction, diverticulitis, perforation, and the presence of a tumor within the diverticulum. In pediatrics, MD usually presents as painless lower GI bleeding, with incidence of 25-50% and intestinal obstruction is the second most common presentation (range 22-55%). MD can harbor heterotopic gastric or pancreatic mucosa (50% and 5% respectively), and, less commonly, colonic, endometrial, or hepatobiliary tissue. The main mechanism of bleeding is the acid secretion from ectopic mucosa, leading to ulceration of adjacent ileal mucosa. In adults, MD presents as gastrointestinal bleed, intestinal obstruction, diverticulitis. In our patient, she presented with diverticulitis [16-18].

Theories

MD was first described in 1941 as a long diverticulum (38.5 inches). At that time, they applied the term ileal duplex to it. The shortening of the vitelline artery during involution, causes traction that pulls the diverticulum upward and towards the mesentery side, hence forming new adhesions and new vascular supply [19]. Subsequent reports proposed two theories: the short artery theory described above and/or an adhesion between the ileal mesentery and the vitelline duct. Research has also reported a rare spontaneous regression of a patent Vitelline duct 3 months after birth, however the duct was found to be on the mesenteric side with no mesodiverticular band and was 40 cm from ileocecal valve.

Table 1 summarizes the mesenteric MDs reported in the literature. It enumerates that 9 adult cases presenting with acute abdomen, and 5 pediatric patients of whom, some presented with lower GI bleed. The pediatric patients had MD very close to ileocecal valve (ICV) within 30-40 cm, whereas adult patients had longer distance from the ICV, amounting from 40 cm to 90 cm. The MD in our patient was 40 from ICV.

Diagnosis

Diagnosis of MD preoperatively is difficult especially in adults. The gold standard is using scintigraphy with sodium 99mTc pertechnetate especially in pediatric patients more than adults. Rossi et al., explained this by decreasing the prevalence of gastric mucosa in the diverticulum in adult patients. Review of the use of scintigraphy in 917 patients, mostly children with MD, showed a sensitivity of 85%, a specificity of 95%, and an accuracy of 90%. CT scan is mostly used in adults in complicated MD as diverticulitis, perforation, or abscess. Ultrasound is not commonly used except in selective cases especially in pediatric. There have been case reports of finding MD by US in intussusception. Barium studies are minimally used in MD diagnosis.

Differential Diagnosis: The differential diagnosis of MD includes ileal duplications, atypical enterogenous cyst, and mesenteric cyst. In general, Meckel's diverticulum has its own artery and connects to the lumen unlike ileal duplication which shares the blood supply and wall of ileum. However, this is still not enough because the vitelline artery is present in about 10% of cases. The enterogenous cyst would have an absence of communication of the structure with adjacent intestinal lumen. Also, ectopic epithelium has been noted occasionally in small intestine diverticula, whereas ectopic tissue is commonly found in Meckel's diverticula.

Management: The main treatment for symptomatic MD is surgical resection. Whether to do diverticulectomy or segmental resection is based on many factors. A base width of more than 2 cm, presence of palpable tissue at base, short MD, and perforation of MD base necessitate segmental resection, otherwise diverticulectomy would be appropriate. It is noted that long MD carry the ectopic tissues at the tip of and diverticulectomy will be appropriate whereas short MD carry ectopic tissue close to ileal lumen; hence segmental or wedge resection is recommended. However, most of the controversy relies whether to resect incidental asymptomatic MD. Most surgeons advocate for removal of asymptomatic MD to avoid future complications. Would the surgical treatment of MD differ based on the location? Mohanty et al., recommended surgical resection of mesenteric MD due to possible devastating complications, as the mesenteric location is more alarming and closer to blood vessels and risk of major bleeding during inflammation process from Table 1, most patients underwent segmental resection and only 3 patients received diverticulectomy.

Morbidity and mortality: Park et al., showed that the morbidity and mortality were higher in asymptomatic patients who underwent diverticulectomy than those symptomatic patients. But they couldn't attribute it particularly to the diverticulectomy itself, as these asymptomatic patients has more complicated clinical conditions, most of them had carcinoma and could have contributed greatly to the morbidity and mortality. However, studies showed a decreased morbidity and mortality and long term post-operative complication of 1%, 2%, and 2% respectively.

Conclusion

Mesenteric Meckel Diverticulum is a rare variant of MD. 13 cases including the present case are known so far. Mesenteric MD was found to be very close to ICV in pediatric patients, whereas far from ICV in adults. Studies agreed on resection of mesenteric MD to avoid complications.

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