



Case report

Gangrenous Meckel's diverticulum with small bowel obstruction mimicking complicated appendicitis: 'Case report'

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ABSTRACT

Introduction: Though Meckel's diverticulum is the most common congenital anomaly of the gastrointestinal tract, it is uncommon in the general population and rare in adults. Its preoperative diagnosis is challenging. While obstruction is the commonest complication, its occurrence with gangrenous Meckel's diverticulum is rare. The aim of this presentation is to report this combination and to create awareness among surgeons and radiologists to increase preoperative diagnosis of Meckel's diverticulum preventing morbidity and mortality from delay in intervention.

Presentation of the case: A twenty-years-old male presented with periumbilical pain that later shifted to lower abdomen, vomiting and fever of 10 h durations. He has no history of smoking or diabetes. Physical examination showed tachycardia, fever, and lower abdominal tenderness. Exploratory laparotomy revealed gangrenous Meckel's diverticulum and ileal obstruction by a band arising from the tip of diverticulum to ileal mesentery. We did segmental resection of the ileum containing Meckel's diverticulum and end-to-end anastomosis with the excellent outcome.

Discussion: Preoperative diagnosis of Meckel's diverticulum is challenging because of non-specific clinical presentations and less sensitivity and specificity of imaging investigations. A high index of suspicion can improve its diagnosis. Axial torsion with gangrenous Meckel's diverticulum is the rarest complication. Management of symptomatic Meckel's diverticulum is surgery. Treatment of silent Meckel's diverticulum is controversial with no strong evidence to treat or not to treat.

Conclusion: Gangrenous Meckel's diverticulum causing small bowel obstruction is rare. Surgeons must have a high index of suspicion to increase preoperative diagnosis of complicated Meckel's diverticulum.

1. Introduction

MD is the most common congenital anomaly of the gastrointestinal tract. It occurs at the anti-mesenteric border of the distal ileum because of incomplete obliteration of the proximal part of the vitelline duct that connects mid gut with the yolk sac in the embryo [1,2]. It was named after the German anatomist Johann Friedrich Meckel who described this entity in 1809 [3]. MD has its own mesentery and all the bowel wall layers hence true diverticulum. MD may contain ectopic tissues most commonly gastric tissue 62 % followed by pancreatic tissue 6 % and rarely colonic, duodenal tissues [4]. In 1978, a study from Japan revealed the anatomical location of MD was at 5 to 150 cm from the ileocecal valve with this distance varying based on the age of the patient [5]. This distance can reach up to 200 cm from the ileocecal valve [1].

Knowing the maximum distance is important especially in searching for MD when the presumed diagnosis is appendicitis and the appendix is normal. The length of MD can range from minimum out pouching to 1 m, with the average length being 3 cm [6].

The occurrence of gangrenous torsion of MD with small bowel obstruction is an extremely rare scenario. Here we report a case of a 20-year-old male who presented with symptoms and signs of complicated appendicitis with Intraoperative findings of torsion of MD with gangrenous change and closed-loop ileal obstruction in line with the SCARE 2020 criteria [7].

2. Presentation of the case

A 20-year-old male from Awash, Ethiopia presented with a complaint

Abbreviations: MD, Meckel's diverticulum; GIT, gastrointestinal tract; GIB, gastrointestinal bleeding.

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of severe colicky abdominal pain of 10 h. The pain was initially periumbilical, later shifted to RLQ and finally involved the lower abdomen. In association with the pain, he had two episodes of vomiting of ingested food and low-grade fever. He had no abdominal distention and failure to pass feces or flatus. He has no history of diabetes, hypertension, asthma, smoking cigarettes or drinking alcohol.

Physical examination - on general appearance he was acutely sick looking and in pain. The vital signs showed HR = 105 beats/min, BP = 120/70 mmHg, RR = 18 breaths/min and Temperature = 37.8 °C. The abdomen was flat move with respiration, no visible peristalsis, and hernia sites are free on inspection. There was direct and rebound tenderness with guarding and rigidity below the umbilicus on palpation. A digital rectal examination revealed a collapsed rectum with loose feces. Examination of all other systems was unremarkable.

Complete blood count (CBC) showed total leukocyte $16 \times 10^9/L$ with 82 % neutrophil, Hgb = 14 g/dl and platelet count of $313 \times 10^9/L$. We did not do other investigations like imaging which are not easily accessible at nighttime in our set up.

With the preoperative assessment of complicated appendicitis, we did low midline exploratory laparotomy. The Intraoperative findings were about 300 ml hemorrhagic fluid, normal appendix, totally gangrenous giant MD which was 8 cm long and undergone a 360° axial torsion with a mesodiverticular band extending from its tip to adjacent ileal mesentery was found at 60 cm from the ileocecal valve, and a loop of the distal ileum herniated under the band with signs of obstruction (Figs. 1 and 2).

The mesodiverticular band was divided (Fig. 3), segmental resection including 2 cm ileum on both sides of the diverticulum and hand sewn double layered end-to-end anastomosis done using vicryl 3/0'. The specimen was examined grossly, and no abnormal thickening or nodule detected. It was not sent for pathology mainly due to accessibility issue. The patient tolerated the procedure well. We discharged him on the seventh post operation day with smooth course. He is on follow-up with no new complaint for the last 3 months.

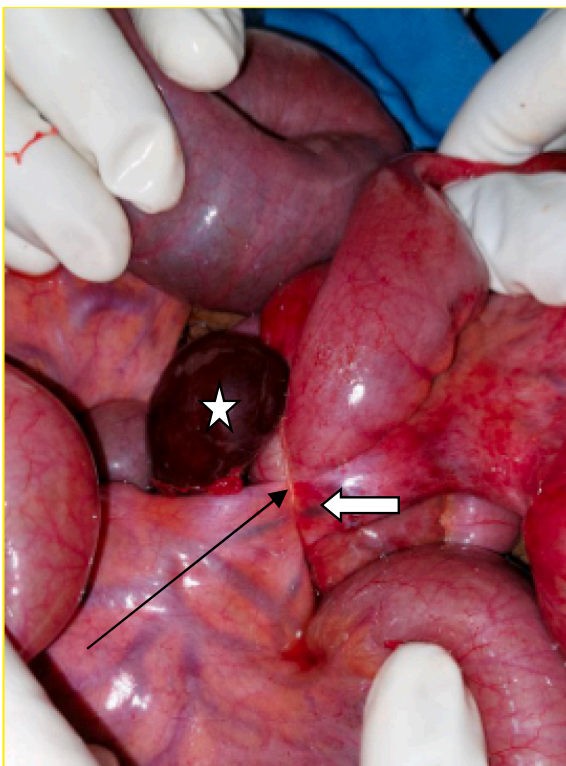


Fig. 1. showing gangrenous MD (star) with a mesodiverticular band (arrow) and a loop of distal ileum with its mesentery herniating under it (solid arrow).

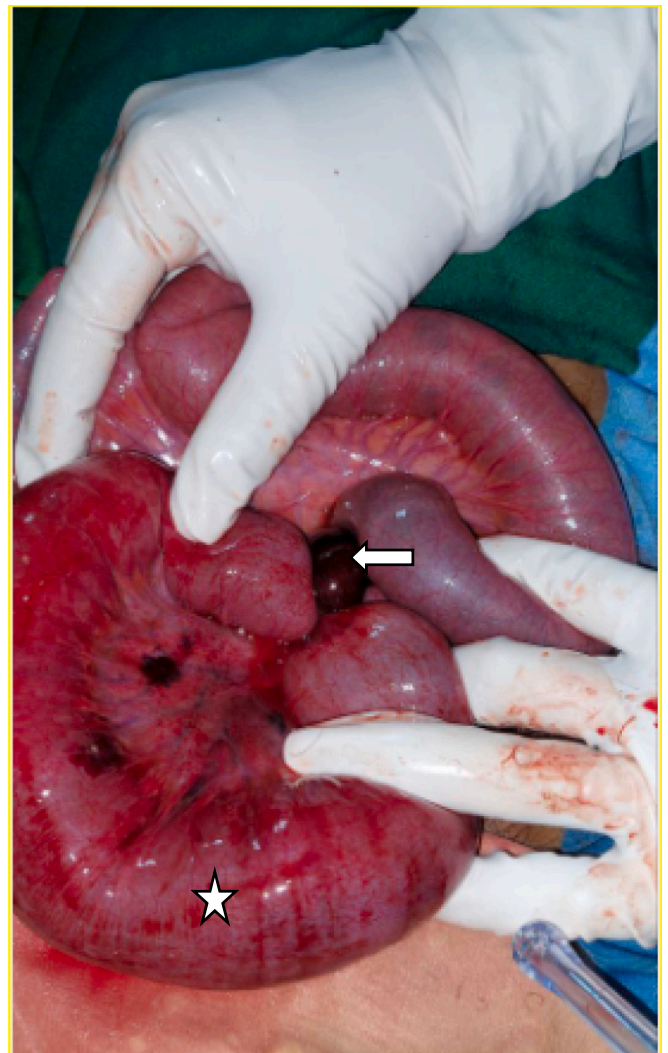


Fig. 2. showing obstructed loop of ileum (star) and gangrenous MD (solid arrow).

3. Discussion

The incidence of MD in the general population is between 0.3 and 2.9 % [1,8]. Its incidence in autopsy specimens ranges from 0.14 to 4.5 % [6]. MD is often asymptomatic and discovered incidentally at surgery or imaging [9]. The life time risk of complications ranges from 4.2 to 9 % [1]. Complications of MD are more common in the male, children before ten years of age, and rare in adults as the incidence decreases with age [10]. The onset of complications is maximal before two years of age, approximately 1 % near 40 years old, and progressively decreasing to nearly nil after 70 years of age [6]. The most common complications of MD are intestinal obstruction, GIB, and diverticulitis in decreasing order in children, while diverticulitis comes before GIB in adults in large retrospective patient series [1,11]. These complications in children constitute obstruction in 46.7 %, hemorrhage in 25.3 % and inflammation in 19.5 % whereas corresponding values for adults are 35.6 %, 27.3 %, and 29.4 % [1]. The rare complications of MD include perforation, enterolith formation, axial torsion, Littre's hernia, ulceration and neoplasm [10,12]. Among these, torsion is one of the rarely reported complications of MD with few case reports [13–15]. MD is at least 70 times more prone to develop a tumor than any point on the ileum in elderly [16].

Axial torsion of MD occurs when MD twists around its axis at its base without involvement of the ileal loop or ileal mesentery which can

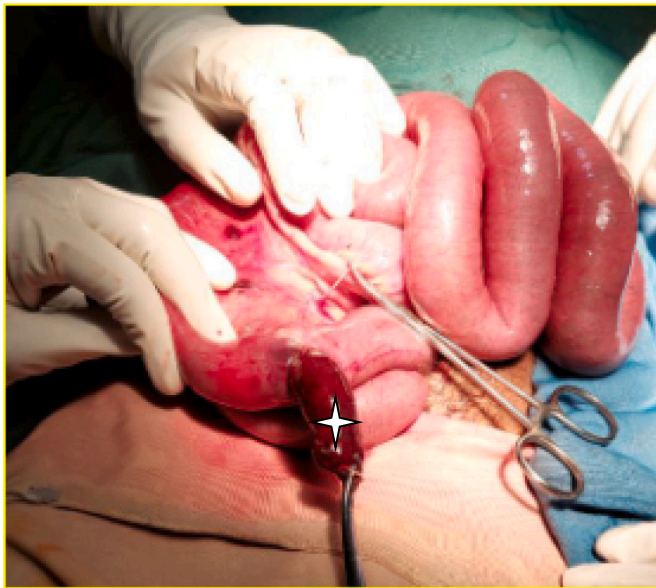


Fig. 3. showing divided mesodiverticular band(held by the hemostats) and gangrenous MD (star).

compromise its blood supply resulting in gangrenous change [17]. Even though, the mechanism of isolated torsion is not clear, there are factors associated with axial torsion of MD. Factors that increase axial torsion of MD include, attachment of MD end to the umbilicus or ileal mesentery by congenital or inflammatory band [2,18], long MD with narrow base [15,17], and rarely primary neoplasm of the MD [19].

Even though intestinal obstruction is the most common presentation of MD [1,11], the occurrence of gangrenous torsion of MD with mechanical intestinal obstruction is extremely rare with fewer case reports [15]. Obstruction due to MD commonly follows intussusceptions while volvulus around the mesodiverticular band, internal hernia, diverticulitis, axial torsion of MD with or without a fibrous band extending from MD to the mesentery or the umbilicus; and tumors are other causes [20]. Both axial torsion with gangrene of MD and bowel obstruction by entrapment between a band extending from the tip of MD to ileal mesentery was the intraoperative finding in the case presented here.

Preoperative diagnosis of MD is challenging owing to its nonspecific clinical presentations and less sensitive and specific imaging investigations [1,12]. Therefore, surgeons and radiologists need to have a high index of suspicion to increase its diagnosis. Imaging investigations like ultrasound, X-ray, angiography, CT scan, and magnetic resonance can be diagnostic for MD but with low sensitivity and specificity. They can show small bowel obstruction and intussusceptions leading to correct surgical interventions while findings like a normal appendix can direct radiologists to look for differential diagnosis like MD [1]. A finding like the vitelline artery branching off the superior mesenteric artery is pathognomonic for MD if seen on angiography done for GIB. MD looks like cystic or blind pouch diverging from the ileum on ultrasound and CT scan. Nuclear scans with Tc-99m pertechnetate can visualize MD, if it contains heterotopic gastric tissue as the tracer accumulates in it. Clinical feature of complicated MD includes abdominal pain, nausea, vomiting, abdominal distension which can point to the wide range of acute abdominal conditions. For example, Meckel's diverticulitis with or without perforation and gangrenous MD can be mistaken for appendicitis [1,14].

Treatment of symptomatic MD is laparoscopic or open surgery [1,20]. The surgical management can be diverticulectomy, wedge resection and segmental resection [6,20]. These procedures can be selected based on the status of the base and adjacent ileum, presence and location of ectopic tissue that can be predicted based on height to

diameter ratio >2 as long diverticulum with ectopic tissue located at the body and head, and <2 as short diverticulum with wide distribution of ectopic tissue including the base [20]. Based on the above criteria, we can do diverticulectomy for long diverticula with a normal base and adjacent ileum, while wedge resection or segmental resection for others.

Whether to treat or not to treat incidentally diagnosed MD is still not settled. But it is reasonable to decide based on the presence of risk factors for future complications [20]. The risk factors include age >50 years, male sex, diverticular length >2 cm and macroscopic abnormalities within the diverticulum suggesting ectopic tissue [6,20]. The overall proportion of complications are 17 %, 25 %, 42 % and 70 % when one, two, three, and four of the above criteria are met respectively. The surgical management for asymptomatic patients is decided intraoperatively based on the above risk factors.

4. Conclusion

Gangrenous Meckel's diverticulum because of axial torsion causing small bowel obstruction is extremely rare. Preoperative diagnosis is often difficult because of non-specific presentation, which usually points to acute abdomen most often acute appendicitis and its complications. Radiologists and surgeons must have a high index of suspicion to increase preoperative diagnosis of complicated MD. Intervention based on clinical diagnosis in case of localized or generalized peritonitis can avoid unnecessary delay; especially in resource limited settings. The management of silent MD is controversial, while that of complicated MD is surgery.

Provenance and peer review

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Ethical approval

The study is exempt from ethical approval in our setup.

Author contribution

1st author, Gosa Hundie Bejiga: (1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data (2) drafting the article or revising it critically for important intellectual content, writing review and editing (3) final approval of the version to be submitted.

2nd author, Zubeyri Beyan Ahmed: (1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data (2) drafting the article, writing review (3) final approval of the version to be submitted.

Consent

Written informed consent was obtained from the patient's next of kin for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Research registration

N/a.

Guarantor

Gosa Bejiga.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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