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Meckel's Diverticulum: A Case Series Highlighting Variability in Presentation, Diagnosis and Surgical Management

Dhaivat K Vaishnav, Sneh M Shah, Bhavin C Patel*

Department of Gastrointestinal Surgery, Zydus Hospitals, Ahmedabad, Gujarat, India

Abstract

Meckel's diverticulum (MD) presents with a wide range of pathology, clinical features, diagnostic challenges, and surgical options. In the absence of standardized guidelines, management often varies across institutions. We conducted a retrospective review of MD cases treated at our institution to assess presentations, diagnostic approaches, and surgical outcomes. Our analysis highlights the variability in clinical presentation and preoperative diagnosis, as well as the individualized nature of intraoperative decision-making. This case series highlights our experience and emphasizes that, until clearer guidelines are established, management of MD continues to depend on case-by-case assessment and available institutional resources.

Introduction

Meckel's diverticulum (MD) is one of the most common congenital anomalies of the gastrointestinal tract, with a prevalence of 0.3% – 2.9% [1]. It is a true diverticulum, resulting from incomplete obliteration of the omphalomesenteric duct, and may contain ectopic mucosa which contributes to its varied clinical manifestations [2].

The "rule of twos" is often used to describe MD — present in approximately 2% of the population, most often diagnosed before the age of two, about two inches in length, and located within two feet of the ileocecal valve, with a male-to-female ratio of 2:1. Lifetime complication rates range from 4%–16%, most frequently including obstruction, ulceration, diverticulitis, and perforation [3].

MD continues to present diagnostic and management challenges. Presentations range from asymptomatic incidental findings to acute abdominal emergencies, and no single imaging modality—whether ultrasound, CT scan, scintigraphy, or endoscopy—has proven consistently reliable for pre-operative diagnosis [4,5]. Surgical resection, either diverticulectomy or resection and anastomosis, is the accepted treatment for symptomatic MD. However, the management of incidentally discovered cases remains controversial [4].

This case series reviews our institutional experience with Meckel's diverticulum, outlining the varied presentations, diagnostic approaches, and surgical strategies. By describing these cases, we aim to represent the ongoing variability in the pre-operative diagnosis and intraoperative decision making, and to emphasize that, in the absence of standardized guidelines, management often remains dependent on the individual case to case basis.

Methods

Data was collected retrospectively from the patient database of a tertiary care hospital from the period of January 2020 to December 2024. All patients diagnosed with MD either preoperatively or intraoperatively were included. For each patient, the hospital records were reviewed to determine patient demographics, presenting symptoms and diagnostic modalities. Details about their surgeries were obtained to determine the type of surgery and surgical techniques. Histopathological results were obtained for the respective patients. Postoperative recovery and complications were analyzed.

Results

Over the span of 5 years, 15 cases were identified who were operated for complications of Meckel's Diverticulum. The range of age was striking from the youngest being 11 years old and oldest being 71 years old. Male to female ratio was 11:4.

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Correspondence:
Dhaivat K Vaishnav, Consultant, Department of Gastrointestinal Surgery, Zydus Hospitals, Zydus Hospitals Road, Near Sola Bridge, S.G. Highway, Ahmedabad - 380054, Gujarat, India, Tel: +91 9825477683;

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Table 1: Demographic and Preoperative Characteristics.

DEMOGRAPHIC AND PREOPERATIVE CHARACTERISTICS					
Case Number	Gender	Age	Clinical Presentation	Time of diagnosis	Imaging technique
Case 1	Male	56	Diverticulitis	Preoperative	CT scan
Case 2	Male	52	Diverticulitis	Preoperative	Ultrasonography, CT scan
Case 3	Female	29	Diverticulitis	Preoperative	Ultrasonography
Case 4	Female	50	Mucocele of appendix	Intraoperative	Ultrasonography, CT scan, Colonoscopy
Case 5	Male	71	Obstruction	Preoperative	Ultrasonography, CT scan
Case 6	Female	28	Obstruction	Preoperative	CT scan
Case 7	Male	48	Melena	Preoperative	CT scan, Colonoscopy
Case 8	Male	42	Obstruction with Melena	Intraoperative	Ultrasonography
Case 9	Male	43	Melena	Intraoperative	Colonoscopy
Case 10	Female	41	Obstruction due to ileal stricture	Intraoperative	Spiral Enteroscopy
Case 11	Male	11	Diverticulitis with obstruction	Intraoperative	Plain X ray abdomen standing
Case 12	Male	43	Perforation	Preoperative	Ultrasonography, CT scan
Case 13	Male	63	Diverticulitis	Preoperative	Ultrasonography, CT scan
Case 14	Male	46	Melena	Preoperative	Ultrasonography, CT scan
Case 15	Male	17	Diverticulitis	Preoperative	Ultrasonography, CT scan

Table 2: Intraoperative Characteristics.

INTRAOPERATIVE CHARACTERISTICS			
Case Number	Mode of surgery	Type of surgery	Method of anastomosis
Case 1	Laparoscopy	Diverticulectomy	Staples
Case 2	Laparoscopy	Resection and anastomosis	Staples
Case 3	Laparoscopy	Diverticulectomy	Staples
Case 4	Robotic	Resection and anastomosis	Staples
Case 5	Laparoscopy	Diverticulectomy	Staples
Case 6	Laparoscopy	Diverticulectomy	Staples
Case 7	Laparoscopy	Diverticulectomy	Staples
Case 8	Open	Resection and anastomosis	Handsewn
Case 9	Laparoscopy assisted	Resection and anastomosis	Handsewn
Case 10	Laparoscopy converted to Open	Resection and anastomosis	Handsewn
Case 11	Laparoscopy	Resection and anastomosis	Staples
Case 12	Open	Resection and anastomosis	Handsewn
Case 13	Open	Resection and anastomosis	Handsewn
Case 14	Laparoscopy	Diverticulectomy	Staples
Case 15	Laparoscopy	Diverticulectomy	Staples

Most common presentations at admission were diverticulitis (40%) followed by obstruction (33.3%). These were followed by melena and perforation. A patient who presented with abdominal pain and loss of appetite with a pre-operative diagnosis of infected mucocele of appendix, was diagnosed to have meckel's diverticulum during surgery. 2/3rd of the patients was diagnosed accurately with MD preoperatively. Ultrasonography (60%) and CT scan (66.6%) were the most common diagnostic modalities. Rarely, colonoscopy, Meckel's scan, Spiral enteroscopy were used. However, accurate diagnosis often required use of multiple modalities (53.3%).

Laparoscopy (60%) was the most common mode of surgery followed by laparotomy done in 4 patients. In one case, laparoscopy was converted to laparotomy, as the meckel's diverticulum was stuck to the umbilicus which led to twisting and subsequent obstruction of the small bowel. Robotic approach was also taken in one case. Preferred types of surgery at our tertiary care centre were diverticulectomy, and resection and anastomosis of small bowel. However, surgeons opted for resection and anastomosis (eight cases) more than diverticulectomy (seven cases) due to complications that had already developed at the time of presentation. Similarly, anastomosis of the bowel wall at the resected part or of two ends of bowel, could be done using staples and sutures. However, handsewn anastomosis (62.5%) was preferred over stapled one (37.3%).

Postoperative complications were infrequent with only 2 patients suffering from postoperative complications. One of the patients developed adhesions postoperatively and therefore, developed

Table 3: Post Operative Characteristics.

POST OPERATIVE CHARACTERISTICS				
Case Number	Histopathology report	Postoperative complication	Clavien Dindo classification of surgical complication (I - V)	Hospital Stay (in days)
Case 1	Inflammation	No	I	3
Case 2	Inflammation	No	I	6
Case 3	Inflammation with Ectopic gastric mucosa and pancreatic mucosa	No	I	4
Case 4	Inflammation with ulcer bleed	No	I	14
Case 5	Inflammation	No	I	7
Case 6	Inflammation	No	I	4
Case 7	Inflammation	No	II	6
Case 8	Inflammation	Yes	IV	18
Case 9	Ectopic gastric mucosa	No	IV	7
Case 10	Inflammation	No	I	7
Case 11	Inflammation	Yes	I	9
Case 12	Tumor (GIST)	No	IV	9
Case 13	Tumor (GIST)	No	I	7
Case 14	Ulcer bleed	No	II	9
Case 15	Inflammation	No	I	6

subacute obstruction. The patient was then operated for adhesiolysis. Calvin Dindo grading was used to classify patients based on surgical complications. 60% of patients belonged to Class I. 13.3% belonged to Class II and 20% to Class IV. Average hospital stay was 8 days with the shortest stay of only 3 days.

Table 3 mentions the histopathological reports of all the cases from the tissue samples taken during surgery. Nine (60%) of patients had inflammation in the diverticular tissue. 4 patients had an ulcer with exposed vessels leading to a bleed. Likewise, 2 had ectopic gastric tissue. Two patients had a very rare presentation of neoplasm - Gastrointestinal stromal tumor (GIST). A single patient had inflammation along with ectopic gastric and pancreatic tissue. Surprisingly, only one patient who presented with melena had ectopic gastric tissue and one patient had an ulcer bleed. In the rest of the patients, the cause of melena was another cause.

Discussion

This case series illustrates the wide spectrum of Meckel's diverticulum (MD) presentations encountered at our institution. The patients in our series demonstrated considerable variability in demographics, pathology, clinical presentation, diagnostic work-up, surgical approach, and postoperative outcomes. The diversity of these factors emphasizes the absence of a universally accepted standard for the diagnosis and management of MD. In our experience, treatment decisions are individualized—tailored to each patient's unique presentation and operative findings—with generally favorable outcomes. Nevertheless, the ongoing variability in presentation and management highlights the need for further studies to clarify the underlying causes of such heterogeneity and to guide evidence-based treatment protocols.

The cause of this varied presentation lies in different aspects of the development of Meckel's diverticulum. Histopathologically, while it's a true diverticulum, it can contain ectopic mucosal tissue namely gastric, pancreatic, colonic, duodenal, endometrial, Brunner's glands, hepato-biliary tissue [2]. Rarely it can also contain neuroendocrine tumors with an incidence of 0.5 - 3.2%, with the risk increasing with age [6]. Anatomically, it can cause small bowel obstruction due to presence of a fibrous band connecting the diverticulum to umbilicus or mesentery, or act as a lead point for intussusception, or cause diverticulitis from incarceration leading to obstruction and inflammation [7,8]. As described by Srisajjakul et al. (2016) in their article titled "Many faces of Meckel's diverticulum and its complications.", while patients can be asymptomatic, the risk of developing complications is 4-25%. Hemorrhage is the most common complication, especially in children, followed by bowel obstruction and diverticulitis. Rarely, there can be enterolith formation, perforation and neoplasm [9]. A review article published in 2020 subsequently elaborated that children are more likely to present with bleeding and abdominal pain due to higher frequency of obstruction and peptic ulcer (due to ectopic gastric tissue). However, complications decrease with age, and therefore, adults who are symptomatic present with diverticulitis or obstruction [10].

"MD is frequently suspected, often looked for and seldom found" quoted by Charles Mayo in 1933 still holds true. Multiple techniques like barium studies, ultrasonography, CT scan, scintigraphy and digital subtraction angiography are currently being used, however, sometimes two or more techniques need to be used in a single patient to confirm the diagnosis [11]. Butler et al. (2025) mentions the use of newer techniques like Small Bowel Capsule Endoscopy and Device assisted Enteroscopy, with their biggest disadvantage being that they are invasive [12]. Currently, diagnostic modality is chosen based on the available modalities at the institution to best diagnose the cause, which sometimes may fail and eventually, MD is diagnosed intraoperatively.

Uncomplicated, intraoperatively MD, according to Zyluk (2019), should be removed in most circumstances namely, above 50 year old males, with MD length more than 2 cm, macroscopic features of ectopic mucosa, narrow neck diverticulum and a fibrous band connecting MD to umbilicus. Specific circumstances under which MD must not be touched are peritonitis, trauma, and old age. Zyluk

(2019) goes on to mention that while it has been an age-old practice to remove accidentally found MD, there are instances where they have been left as it is without any complication postoperatively [13]. Widely accepted treatment for symptomatic MD continues to remain diverticulectomy and small bowel resection. A retrospective study concluded that diverticulectomy is safer compared to small bowel resection due to lesser complications and no requirement of a subsequent operation [14]. Another study went on to say that both the outcomes in both surgeries were equal and the surgery to be done depends on case to case basis [15].

This study has limitations. Its retrospective design and small sample size limit the generalizability of findings. Furthermore, variability in preoperative work-up—often based on available institutional resources—may have introduced bias in diagnostic modality use. Finally, short-term follow-up may underestimate late complications.

In conclusion, our experience reinforces that MD presents with considerable heterogeneity in clinical features, diagnostics, and management. While our findings align with established literature, they also underscore the continued need for individualized treatment planning, especially in adult patients. Larger multicenter prospective studies are warranted to better define risk stratification criteria, standardize diagnostic pathways, and optimize surgical decision-making for MD.

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