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The clinical presentation of Meckel's diverticulum: Eight years experience

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ABSTRACT

Objective: Meckel's diverticulum is the most common congenital anomaly of the gastrointestinal tract. It is commonly encountered during surgical practice as the cause of the patient's presentation or as an incidental finding during other unrelated procedures. This study aimed to evaluate the frequency of Meckel's diverticulum in our clinical practice and to provide an adequate level of knowledge of the clinical and diagnostic features and the management of Meckel's diverticulum.

Material and Methods: We analyzed the medical records of all cases who were diagnosed with Meckel's diverticulum at our hospital for over eight years. Age, sex, presentation, diagnostic procedures, surgical techniques, and histopathology were reviewed and analyzed.

Results: A total of 104 patients were enrolled in our study. Mean age was 28.8 years, with male predominance in 92 (88.5%) patients. Symptomatic Meckel's diverticulum was detected in 80 (77%) patients and in 24 (23%) incidental findings. The most common emergency presentation was abdominal pain with 34 patients (42.5%), then intestinal obstruction with 20 patients (25%), bleeding per rectum with 12 patients (15%), acute abdomen with nine patients (11.3%), and intussusception with five patients (6.2%). Mean length of the Meckel's diverticulum was 4.3 centimeters. Small bowel resection was performed in 41 (45.1%) cases, stapled resection in 44 (48.3%), and ligated Meckel's base in 6 (6.4%). Ectopic gastric mucosa was the most common finding in histopathology in 30 (28.8%) patients.

Conclusion: Our study supports that the longer Meckel's diverticulum is, the more prone it is to developing complications, and stapler resection and small bowel resection are considered safe techniques, as well as resection of incidental Meckel's diverticulum, which does not increase the risk of morbidity.

Keywords: Meckel's diverticulum, gastrointestinal tract, small bowel resection

INTRODUCTION

Meckel's diverticulum (MD) is the most common congenital malformation of the gastrointestinal tract (1-3). It was described first in 1598 by Fabricius Hildanus, then by Levator in 1617 and Ruysch in 1730, but its name is derived from Johann Friedrich Meckel, who described its embryological and pathological features in 1809 (4-7). It is present in approximately 2-3% of the population and located on the antimesenteric border of the ileum, approximately 45-60 cm proximal to the ileocecal junction, and its length ranges from 3-5 cm in most of the patients (8). It is a true diverticulum, i.e., the walls contain all the three layers of the intestinal wall, and it has its own blood supply arising from the superior mesenteric artery (9). The mucosa of the diverticulum may contain heterotopic gastric mucosa (50%), pancreatic mucosa (5%), and less commonly colonic mucosa, endometriosis, or hepatobiliary tissue. These types of mucosae make it vulnerable to other complications such as hemorrhage, chronic peptic ulceration, and perforation (9).

It is commonly encountered during surgical practice as the cause of the patient's presentation or as an incidental finding during diagnostic imaging or surgical procedures (10). It generally remains silent, but some serious complications may occur, thus increasing its importance in clinical practice, such as bleeding, intussusception, intestinal obstruction, perforation, fistulas, or umbilical sinuses, and tumors (10,11). Bleeding is life-threatening in childhood, while intestinal obstruction is more common in adulthood (1,12,13).

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Preoperative diagnosis of a complicated MD can be challenging and is often difficult to establish because the clinical symptoms and imaging features of a complicated MD overlap with those of many other disorders that cause acute abdominal pain or gastrointestinal bleeding (14). Complications are more common in younger patients and decrease with advancing age (3). In this retrospective study, we aimed to evaluate the frequency of MD in our clinical practice and to provide an adequate level of knowledge of the clinical presentation and diagnostic features as well as the management of MD in all age groups.

MATERIAL and METHODS

Archive records of our surgical facilities from January 2015 to April 2023 were analyzed retrospectively. Files of patients with MD were reviewed. Age, sex, presenting symptoms, and preoperative diagnoses were recorded. Pediatric patient was defined as a patient younger than 14 years according to our hospital rules and an adult patient who is 14 years of age or older.

Symptomatic cases presenting with abdominal pain, gastrointestinal bleeding, intestinal obstruction, or intussusception, were evaluated with the preoperative diagnostic procedures used in each case, such as ultrasound, endoscopies, including capsules, computer tomography (CT), magnetic resonance imaging (MRI), CT, and MRI enterocolitis or Meckel's scan. The details of the management approach and surgical procedure, open or laparoscopic are shown in Figure 1. Intraoperative findings and types of MD resections were collected. Cases detected incidentally during another surgical procedure were classified as incidental findings or asymptomatic (Figure 2). Remarkably, in three cases, there was a traumatic penetration by a foreign body fish bone (Figure 3).

The indications and type of resection were evaluated. The length and base width of the diverticulum was collected from preoperative diagnostic imaging, an operative note, or a pathology report.

Hospital stay, mortality and morbidity rates were calculated for cases that underwent MD resection. Histopathology results were also retrieved to look for the presence of inflammation, ectopic tissue, or neoplastic changes within the diverticulum. Data are displayed in terms of frequency, mean, median, and standard deviations. Proportions are compared with the Chi-square test, and statistical calculations were done using the Statistical Package for Social Sciences (SPSS 25, IBM, USA).

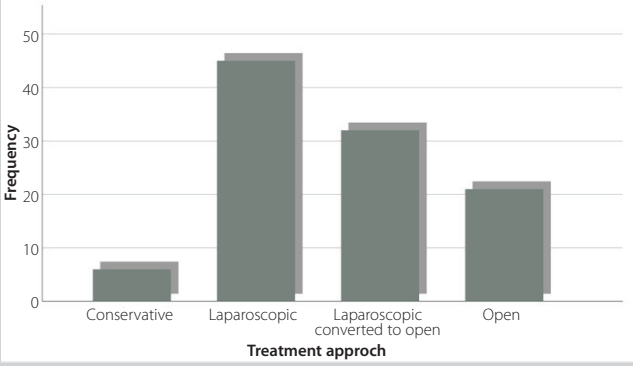

Figure 1. Types of management approaches and frequency of surgical procedures.

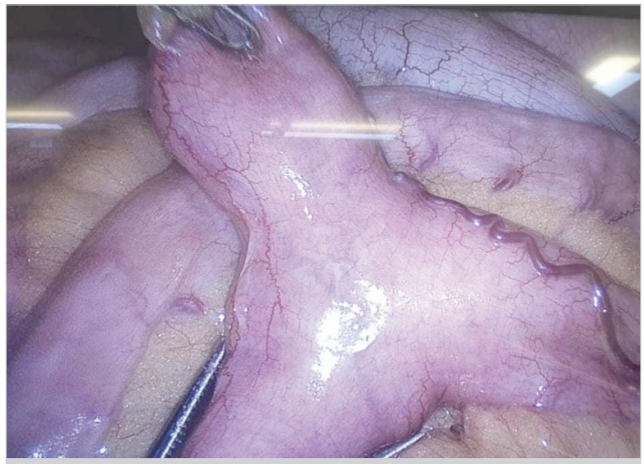

Figure 2. Meckel's diverticulum was discovered as an incidental finding in unrelated surgical procedures.

Figure 3. Perforation of Meckel's diverticulum by fish bone.

The authors declare that they have no conflict of interest, and the study was approved by the Institutional Review Board (IRB) (MRC-01-24-528).

RESULTS

A total of 104 patients were included in our study. Mean age of the involved patients was 28.87 years (ranging from one year to 70 years), with male predominance at 92 (88.5%) compared to 12 (11.5%) females. Mean age of the pediatric patients was 6.52 years, with 16 (76.2%) males and 5 (23.8%) females, while in the adult age group, mean age was 34.53 years, with 76 males (91.6%) and seven females (8.4%). Upon review of patient's files,

we found 80 (77%) patients presented with symptomatic MD, 67 (95%) were adults, and 13 (5%) were pediatrics, while in 24 (23%) cases, MD was found incidentally during unrelated surgical procedures (Figure 2). In symptomatic cases, the most common presenting symptom was abdominal pain in 34 (42.5%), followed by intestinal obstruction in 20 (25%), bleeding per rectum in 12 (15%), acute abdomen in 9 (11.3%), and intussusception in 5 (6.2%). There was a variation between adult and pediatric patients: abdominal pain was the most common finding in adult patients, 34 (50.7%), followed by intestinal obstruction, 17 (25.4%), and in pediatric patients, bleeding per rectum was the most common, 5 (38.5%), followed by intestinal obstruction, and intussusception, 3 (23.1%) for each.

Regarding the diagnostic tests used in our study, we found plain abdomen x-rays were done in 73 (70%) cases, ultrasonography in seven (6.7%) cases, CT scans in 75 (72.1%) cases, MRI enterocolitis in two (0.19%) cases, colonoscopy in eight (7.6%) cases, capsule endoscopy in two (0.19%) cases, and nuclear medicine (NM) scans in 11 (10.5%) cases. Preoperative pathological MD was diagnosed in 44 (56.2%) cases out of 80, 31 (38.7%) by CT scan, and seven (8.7%) by NM scan, three (3.7%) by US, two (2.5%) by MRI enterocolitis, and two (2.5%) by endoscopy capsule.

Ninety-eight (94.2%) patients underwent surgical procedures in this series; open approach was performed in 21 (21.4%) cases and laparoscopic in 77 (78.6%) cases, with conversion to open in 32 (41.5%) cases. Among the 80 symptomatic cases, 74 (92.5%) of them underwent surgical procedures with MD resection, and six (7.5%) patients were treated conservatively. Out of 74 operated-symptomatic patients, 38 (51.4%) underwent small bowel resection and anastomosis (SBR), 34 (45.9%) underwent stapler MD resection (SR), and two (2.7%) underwent ligated MD base. In 24 unrelated surgery procedures where the MD was found incidentally, 17 (70.8%) cases underwent MD resection, three (12.5%) cases by SBR technique, 10 (41.6%) cases by SR, and four (16.6%) cases by ligated MD base. Intraoperative findings in symptomatic MD as described in Table 1 showed normal MD in 12 cases (16.3%), intestinal obstruction due to the MD band in 20 (27%), inflamed MD in 19 (25.6%), perforated MD in 13 (17.5%), intussusception in 5 (6.8%), and mass formed by MD in 5 (6.8%).

Mean length of the diverticulum was 4.3 cm, and mean width was 2.4 cm. In operative cases, drain was used in 18 (18.4%) cases, with a mean duration of 6.27 days. Mean hospital stay was 8.1 days. Morbidity was recorded in eight (8.16%) cases, and four (4%) cases with wound infection, and four (4%) cases reoperated due to abdominal collection in one (1.02%) case, lower GIT bleeding in one (1.02%) case, wound dehiscence in one (1.02%) case, and a second look in one (1.02%) case. Mortality was recorded in one (1.02%) case.

Out of 91 resected Meckel's diverticula, they were sent for histopathological examination, which showed normal wall MD in 37 (40.6%), acute inflammation in the wall of the diverticulum in 31 (34.1%), chronic inflammation in 12 (13.2%), and perforated MD in 11 (12.1%). The absence of any abnormal mucosa was found in 47 cases (51.7%), and their presence was detected in 44 cases (48.3%); ectopic gastric mucosa was detected in 22 cases (24.2%), ectopic pancreatic mucosa in two cases (2.2%), ulcerated mucosa in 10 cases (10.9%), mixed gastric and pancreatic in three cases (3.3%), mixed gastric and ulcerated in four cases (4.4%), reactive lymphoid in two cases (2.2%), and the presence of follicular hyperplasia was detected in one case (1.1%).

Table 1. Clinical presentation, treatment approach, and operative findings of study cases

Symptoms	Treatment approach/No of cases		Operative finding/No of cases		No	%
Symptomatic Meckel's diverticulum						
Abdominal pain	Conservative Laparoscopic resection Laparoscopic to open surgery Open resection	6 15 8 2	Not operated Inflamed Meckel's diverticulum Phlegmon Perforated Meckel's diverticulum	6 19 5 4	34	32.6%
Acute abdomen	Laparoscopic resection Laparoscopic to open surgery Open resection	2 6 1	Perforated Meckel's diverticulum	9	9	8.6%
Bleeding per rectum	Laparoscopic resection Laparoscopic to open surgery Open resection	5 6 1	Congested Meckel's diverticulum	12	12	11.5%
Intestinal obstruction	Laparoscopic resection Laparoscopic to open surgery Open resection	9 9 7	Meckel's diverticulum band Intussusception	20 5	25	24%
Asymptomatic Meckel's diverticulum						
Incidental finding	Unrelated surgical procedures		Normal Meckel's diverticulum		24	23%

DISCUSSION

MD is considered the most common congenital malformation of the gastrointestinal tract, with an incidence rate around 2% (15). The lifetime risk for the development of complications related to MD is estimated to be around 4%, and the probability for the development of complications decreases with age (3,15-17). In our series, we found the commonest presentation was with abdominal pain in 34 patients (42.5%), while intestinal obstruction is the most common presenting symptom in adults, and the bleeding per rectum is the most common in pediatrics (1,12,13,15). Surgical resection is the main treatment for symptomatic MD, but there is still debate on asymptomatic cases (14). Ectopic gastric mucosa is predominant, and bleeding is mostly related to it, but not all ectopic gastric mucosa can cause bleeding (18,19).

With exceptions for patients presenting with symptoms of bleeding, a preoperative diagnosis of symptomatic MD is difficult and may be challenging (14,20). This is because the clinical and radiological findings resemble those of other acute abdominal conditions. Proper preoperative diagnosis was achieved in 45 patients (56.25%). In doubtful symptomatic cases, diagnostic laparoscopy was done, and it was a good option as both a diagnostic and therapeutic procedure (20). Most of the cases were operated laparoscopically with conversion to open in 29 patients (48.3%) cases. Conversion rate was nearly 50% due to limited visualization, difficult dissection, as documented in the operative note, and, to some extent, the surgeon's experience. When the length of MD (> or < 2 cm) was compared between symptomatic and asymptomatic patients, it was found that the length of MD in the symptomatic group was significantly longer than that in the asymptomatic (p value 0.0148), supporting the fact that longer diverticula are more likely to develop complications (9,15,18).

As the treatment of symptomatic Meckel's requires definitive surgical intervention, elective surgery is not recommended for cases where the MD is discovered incidentally on radiological imaging (14,18,21,22). Although there is agreement for prophylactic resection of incidentally discovered MD in young patients, it is still controversial in adult patients, and its removal is recommended only in the presence of risk factors such as male sex, age smaller than 45 years, the length of the MD greater than 2 cm, and the presence of a thick wall or fibrous band (18,21,22). The debate is between the risk of developing life-threatening complications post-prophylactic resection and the risk of future complications if unresected silent MD (23-25). A previous research has reported a 2% complication rate after MD resection over 20 years and a 6% lifetime risk of developing complicated MD presentations necessitating surgical management (26). So, they are arguing prophylactic resection if there are no contraindications like immunosuppression or hypoalbuminemia to avoid the risk of developing the future life-threatening presentation that is not decreasing with age (3,15,16,17,26). However, other literature does not share this view who found that the risk of postoperative complications after prophylactic resection is 5% and about 750 to 800 prophylactic resections would have to be done in order to save one life (27,28). Because of the lack of long-term follow-up, we cannot assess the late complications between patients with resected and non-resected MD. Therefore, it is essential to evaluate each case individually to determine whether to resect or not, taking into consideration the risk factors, the patient's condition, and the experience of the surgeons. In comparison of the complication rate post-MD resection in symptomatic and asymptomatic cases, it was found that the complication rate in symptomatic patients was higher than that in asymptomatic patients with statistical significance (p value 0.0144), and there was no difference in the complication rate between resected and non-resected MD in asymptomatic patients (p value 0.892), which supports that the resection of incidental MD, if indicated during an unrelated surgery procedure, does not increase the risk of postoperative complications (25).

The selection of the surgical procedure depends on the type of presentation, the character of the base of the diverticulum, its length, and the status of the adjacent ileum (9,15,29). In diverticula that are short and broad-based, the ectopic tissue may theoretically extend into the base and the ileum, with the potential for complications related to acid secretion and malignant transformation (9,15,29). Thus, the surgical objective is to resect all ectopic mucosa without increasing patient operative morbidity. Therefore, SBR with primary anastomosis is commonly performed and advisable over SR to ensure complete resection of any heterotopic mucosa or intestinal ulcer and to avoid the restriction of the bowel lumen (9,30). This study demonstrated that both SBR and SR techniques were safe in emergency and incidental settings using an open or laparoscopic approach based on surgeon preference. When comparing the complications presented in both techniques, no statistically significant difference was found (p value 0.396).

The resected samples of both symptomatic and asymptomatic MD were examined by histopathology. Normal MD was found in cases with resection of silent MD or intestinal obstruction caused by the MD band. There is agreement that ectopic gastric tissue is the commonest and the main cause of bleeding MD, which was our finding in this study as detected in 29 cases (65.9%) (2,31). The anticipated complication rate for Meckel's resection is approximately 5%, and the most common complications are surgical site infection, prolonged postoperative ileus, and anastomotic leak, which are expected for any small bowel surgery (11,16,18,25). Death related specifically to the resection of MD is rare, with an estimated incidence of 0.001% (27).

In our study, morbidity was recorded in 8 (8.16%) cases, we also recorded one death (1%) because of multiple co-morbidities and not directly related to MD complications.

CONCLUSION

Our study supports that the longer MD is, the more prone it is to cause complications, and stapler resection and small bowel resection are considered safe techniques, as well as resection of incidental MD, which doesn't increase the risk of morbidity.

Ethics Committee Approval: The study was approved by Hamad Medical Corporation Medical Research Center (Decision no: MRC-01-24-528, Date: 08.09.2024).

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Author Contributions: Concept - SM, AZ; Design - LJ, IS; Supervision - SM, AZ; Data Collection and/or Processing - LJ, SD, IS, TG; Analysis and/or Interpretation - AZ, SM, MG; Literature Search - LJ, IS, MG; Writing Manuscript - LJ, SD, IS, TG; Critical Reviews - SM, SM, MG, TG; Project Administration Software - SM, AZ, MG, SM, SD.

Conflict of Interest: The authors have no conflicts of interest to declare.

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ORİJİNAL ÇALIŞMA-ÖZET
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Meckel divertikülünün klinik görünümü: Sekiz yıllık deneyim

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ÖZET

Giriş ve Amaç: Meckel divertikülü gastrointestinal sistemin en sık görülen konjenital anomalisidir. Genellikle cerrahi uygulamalar sırasında hastanın başvurusunun nedeni olarak veya diğer işlemler sırasında tesadüfi bir bulgu olarak karşılaşılmaktadır. Klinik pratiğimizde Meckel divertikülü sıklığını değerlendirmek ve Meckel divertikülünün klinik ve tanısal özellikleri ile yönetimi hakkında yeterli düzeyde bilgi sağlamak amaçlanmıştır.

Gereç ve Yöntemler: Sekiz yılı aşkın süredir hastanemizde Meckel divertikülü tanısı konulan tüm vakaların tıbbi kayıtlarını inceledik. Yaş, cinsiyet, sunum, tanı prosedürleri, cerrahi teknikler ve histopatoloji gözden geçirildi ve analiz edildi.

Bulgular: Çalışmamıza toplam 104 hasta dahil edildi; ortalama yaş 28,8 olup 92 (%88,5) hastada erkek çoğunluktaydı. Hastaların 80'inde (%77) ve 24'ünde (%23) tesadüfi bulgularla semptomatik Meckel divertikülü tespit edildi. En sık görülen acil başvuru şekli karın ağrısı 34 (%42,5), bağırsak tıkanıklığı 20 (%25), rektum başına kanama 12 (%15), akut karın 9 (%11,3) ve invajinasyon 5 (%6,2) idi. Meckel divertikülü ortalama uzunluğu 4,3 santimetre idi. Olguların 41'ine (%45,1) ince bağırsak rezeksiyonu, 44'üne (%48,3) zımbalı rezeksiyon, 6'sına (%6,4) Meckel tabanı bağlandı. Histopatolojide 30 (%28,8) hastada en sık görülen bulgu ektopik mide mukozasıydı.

Sonuç: Çalışmamız, Meckel divertikülü ne kadar uzun olursa komplikasyon gelişme olasılığının da o kadar yüksek olduğunu, stapler rezeksiyonu ve ince bağırsak rezeksiyonunun güvenli teknikler olarak kabul edildiğini, ayrıca tesadüfen Meckel divertikülü rezeksiyonunun morbidite riskini arttırmadığını desteklemektedir.

Anahtar Kelimeler: Meckel divertikülü, gastrointestinal sistem, ince bağırsak rezeksiyonu

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