

To cite this article: Ucaner B, Ciftci MS. Symptomatic Meckel's Diverticulum in Adult Patients: Our Single Center 6-Year Clinical Experience and Results. Turk J Clin Lab 2023; 4: 690-695

■ Research Article

Symptomatic Meckel's Diverticulum in adult patients: our single center 6-year clinical experience and results

Erişkin hastalarda semptomatik Meckel Divertikülü: Tek merkez 6 yıllık klinik deneyim ve sonuçlarımız

 Burak Ucaner*¹,  Mehmet Sabri Ciftci²

¹Gülhane Training and Research Hospital, General Surgery Clinic, Ankara, Turkey,

²Sincan Training and Research Hospital, General Surgery Clinic, Ankara, Turkey.

Abstract

Aim: Meckel's diverticulum (MD) is an embryological remnant that results from the incomplete obliteration of the omphalomesenteric or vitelline duct after birth and it is the most common congenital anomaly of gastrointestinal tract. MD is usually asymptomatic and presents in the pediatric population. In this study, it was aimed to analyze the clinicopathological characteristics of MD, which has an important place in the differential diagnosis of acute abdomen and is difficult to diagnose in the preoperative period, in the light of current literature and to examine the results

Material and Methods: Patients diagnosed with Meckel's diverticulum and underwent surgery between January 2017 and January 2023 in the general surgery clinic were retrospectively scanned. Preoperative, intraoperative and postoperative data of the patients were examined and analyzed.

Results: Sixteen of the cases were male and 6 of them were female. Comorbid disease was present in 7 cases. Abdominal pain (72.7%) was the most common symptom, while heterotopic tissue was observed in 9 cases in histopathological evaluation. Postoperative surgical complication was observed in 6 patients and the most common complication was found to be ileus (3 patients). Mortality was observed in one patient in the postoperative period.

Conclusion: Meckel's diverticulum should always be kept in mind in the differential diagnosis of acute abdominal pain. Delay in diagnosis and going unnoticed during surgery increase mortality and morbidity rates, especially in symptomatic patients and pathologies associated with other causes of acute abdomen.

Keywords: Meckel's diverticulum, diverticulitis, acute abdomen, small bowel resection

Corresponding Author*: Burak Ucaner, Gülhane Training and Research Hospital, General Surgery Clinic, Ankara, Turkey.

E-mail: burakucaner@hotmail.com

Orcid: 0000-0002-5420-3810

Doi: 10.18663/tjcl.1321925

Received: 03.07.2023 accepted: 27.09.2023

Öz

Amaç: Meckel divertikülü (MD), doğum sonrasında omfalomezenterik veya vitellin kanalın tam olmayan obliterasyonu sonucunda oluşan embriyolojik bir kalıntıdır ve gastrointestinal sistemin en sık gözlenen konjenital anomalisidir. MD genellikle asemptomatik olup; genellikle çocuk hasta popülasyonunda semptom vermektedir. Bu çalışmada; akut batının ayırıcı tanısında önemli yeri olan, preoperatif dönemde tanı konulmasının zor olduğu MD'nin güncel literatür bilgileri eşliğinde klinikopatolojik özelliklerinin analizi ve sonuçların incelenmesi amaçlandı.

Gereç ve Yöntemler: Ocak 2017 - Ocak 2023 tarihleri arasında genel cerrahi kliniğinde Meckel divertikülü tanısı alan ve ameliyat edilen hastalar retrospektif olarak tarandı. Çalışmaya 18 yaşın altındaki hastalar ve inflamatuvar bağırsak hastalığı tanısı olan hastalar dahil edilmedi. Hastaların preoperatif, intraoperatif ve postoperatif verileri incelenerek analiz edildi.

Bulgular: Çalışmaya dahil edilen 22 olgunun yaş ortalaması $44,6 \pm 14,6$ yaş (20-74 yaş) idi. 16 olgu erkek, 6 olgu ise kadındı. Erkek/kadın oranı 2,7/1 idi. 7 olguda komorbid hastalık mevcuttu. Karın ağrısı (%72.7) en sık gözlenen semptom iken histopatolojik değerlendirmede 9 olguda heterotopik doku izlendi. Postoperatif cerrahi komplikasyon 6 hastada izlenirken en sık gözlenen komplikasyonun ileus (3 hasta) olduğu saptandı. Postoperatif süreçte bir hastada mortalite gözlemlendi.

Sonuç: MD akut batında ayırıcı tanıda her zaman akılda bulundurulması gereken patolojilerdendir. Tanıda gecikilmesi ve ameliyat esnasında gözden kaçması özellikle semptomatik olan hastalarda ve başka akut batın sebepleri ile ilişkilendirilebilen patolojilerde mortalite ve morbidite oranlarını artırmaktadır.

Anahtar kelimeler: Meckel divertikülü, divertikülit, akut batın, ince bağırsak rezeksiyonu

Introduction

Meckel's diverticulum (MD) is an embryological remnant, resulting from the incomplete obliteration of the omphalomesenteric or vitelline duct after birth and it is the most common congenital anomaly of gastrointestinal tract. [1]. MD contains all three layers of the intestinal wall and is thus a true diverticulum. While true diverticulum can be congenital in the gastrointestinal tract in general, false diverticulum appears as acquired lesions [2].

The "rule of 2s" is used in the diagnosis of Meckel diverticulum. According to the rule of 2s; the distance of the diverticulum from the ileocecal valve is 2 feet (60 cm). Meckel's diverticulum occurs in about 2% of the population. The length of the diverticulum is approximately 2 inches (5 cm). The majority of patients are usually under 2 years of age [3]. Microscopically, the diverticulum usually contains 2 types of heterotopic tissues; gastric and pancreatic. Approximately 2% of patients develop complications. Although it was reported that the disease is 2 times more common in men than women, in current studies this rate was stated to be observed up to 4 times. [4, 5].

MD is usually asymptomatic and usually causes symptoms in pediatric patient population. Symptoms occur as a result of complications that might develop due to the disease. The

most common complications include intestinal obstruction, bleeding and diverticulitis [6, 7]. Symptoms of the disease are usually nonspecific; a significant portion of the patients were operated due to acute appendicitis and diagnosed with MD during surgery [8, 9].

In this study, it was aimed to examine and analyze the clinicopathological characteristics of patients with MD, which has an important place in the differential diagnosis of acute abdomen and is difficult to diagnose in the preoperative period, and to evaluate the results in a single-center experience in the light of current literature.

Material and Methods

Patients who were diagnosed with Meckel's diverticulum and operated in a tertiary hospital general surgery clinic between January 2017 and January 2023 were screened retrospectively. Patients under the age of 18 and patients diagnosed with inflammatory bowel disease were not included in the study. A total of 22 patients were included in the study. Medical file records, laboratory results, and pathology reports of the patients were examined. Demographic and clinicopathological characteristics of the patients were recorded. This study was approved by XXXXXXXX: University of Health Sciences Gülhane Training and Research Hospital, Clinical Research

Ethics Committee (Date: June 7, 2023, Decision No: 2023/126). This study was conducted in accordance with the World Medical Association Declaration of Helsinki-Ethical Principles for Medical Research Involving Human Subjects.

Statistical Analysis

Statistical analyzes were performed using SPSS package program version 22.0. Conformity of the variables to the normal distribution was examined using visual (histograms and probability graphs) and analytical methods ("Shapiro-Wilk tests"). Continuous variables with normal distribution were presented as mean ± standard deviation; non-normal variables were reported as median (minimum-maximum value). Categorical data were shown as numbers (percentages). $p < 0.05$ was considered statistically significant.

Results

Mean age of 22 cases included in the study was 44.6 ± 14.6 years (20-74 years). 16 patients were male and 6 were female. Male/female ratio was 2.7/1. ASA scores of the cases varied between I-III. Comorbid diseases were present in seven cases (Table 1).

Characteristic	Number (percentage)
Age*	44.6 ± 14.6
Gender	
Male	16 (72.7)
Female	6 (27.3)
ASA	
I	9 (40.9)
II	11 (50.0)
III	2 (9.1)
BMI (kg/m2)*	26.8 ± 4.3
Smoking (+)	13 (59.1)
Alcohol (+)	7 (31.8)
Comorbidity **	7 (31.8)

*Mean ±SD
 **Comorbidity= Hypertension (n=5), Diabetes mellitus (n=2), Coronary artery disease (n=2), Chronic renal failure (n=1)
 ***ASA; American Society of Anesthesiologists

The most common symptoms observed in the general symptom questioning were abdominal pain (72.7%), nausea/vomiting (50.0%), constipation (31.8%) and bleeding (22.7%). All patients had symptoms associated with Meckel's diverticulum. Eight patients had Meckel's diverticulitis, 7 patients had intestinal obstruction, 5 patients had bleeding, 2 patients had invagination, and intrabdominal abscess was present in 1 patient (Table 2). In the process of diagnosing patients in the preoperative period; Ultrasonography (USG)

was performed in 6 (27%) patients, computed tomography was performed in 5 (23%) patients, and both imaging methods were performed in 11 (50%) patients.

Characteristic	Number (percentage)
Age*	44.6 ± 14.6
Gender	
Male	16 (72.7)
Female	6 (27.3)
ASA	
I	9 (40.9)
II	11 (50.0)
III	2 (9.1)
BMI (kg/m2)*	26.8 ± 4.3
Smoking (+)	13 (59.1)
Alcohol (+)	7 (31.8)
Comorbidity **	7 (31.8)

*Mean ±SD
 **Comorbidity= Hypertension (n=5), Diabetes mellitus (n=2), Coronary artery disease (n=2), Chronic renal failure (n=1)
 ***ASA; American Society of Anesthesiologists

Preoperative laboratory results of the cases are given in Table 3.

Laboratory	Mean ± SD
CRP (mg/dL)*	28.4 (6.7-120.4)
WBC (103/μl)	14.4 ± 3.9
Neutrophil count (103/μl)	12.5 ± 3.7
Lymphocyte count (103/μl)*	1.2 (0.3-3.2)
Platelet count (103/μl)	283 ± 51
Albumin (g/dl)	4.1 ± 0.3
Hemoglobin (g/dl)	12.7 ± 1.6
Hematocrit (%)	37.7 ± 3.6
BUN (mg/dl)	32.0 ± 7.6
Creatinine (mg/dl)*	0.86 (0.56-2.15)

*Median (min-max)
 **CRP; C-Reactive protein, WBC; white blood cell count, BUN; blood urea nitrogen
 ***Min-max: Minimum-maximum.

When the cases were evaluated as surgical method, segmental small bowel resection and side-to-side anastomosis were preferred in 12 cases, diverticulectomy was preferred in 6 cases, ileocecal resection and ileocolic end-to-side anastomosis were preferred in 2 cases, and right hemicolectomy and ileocolic end-to-side anastomosis were preferred in 2 cases. Diverting ostomy was not preferred in any operated patient. The median surgery duration was 85 minutes (65-185 minutes). In histopathological evaluation, heterotopic tissue was observed in 9 cases (gastric mucosa in 7 cases, pancreatic tissue in 1 case, and both

gastric and pancreatic tissues in 1 case). The mean Meckel's diverticulum size was 3.0 ± 0.7 cm (2.0-4.5 cm). The median length of the resected intestine was 17.5 cm (2.0-120 cm). The mean hospital stay of the cases was 3.7 ± 1.9 days (2-8 days). 8 patients were admitted to the ICU postoperatively. Five of these cases stayed in the ICU for 1 day and three of them for 2 days. 1 (12%) of the patients was followed in the ICU due to a history of immunodeficiency, 5 (62%) due to advanced age and coronary artery disease, and 2 (26%) due to poor general condition. Postoperative surgical complications were observed in 6 patients. Three patients had ileus, 2 patients had wound infection, and 1 patient had bleeding. One patient died in the postoperative period (Table 4).

Table 4. Histopathological, prognostic characteristics and postoperative results of the patients

Laboratory	Mean \pm SD
Heterotopic tissue in pathology	9 (40.9)
Gastric mucosa	7 (31.8)
Pancreatic tissue	1 (4.5)
Gastric + pancreatic tissue	1 (4.5)
Meckel size (cm)	3.0 ± 0.7
Resected bowel length (cm)	17.5 (2.0-120.0)
Length of hospital stay (days)	3.7 ± 1.9
ICU hospitalization*	8 (36.4)
Length of Stay in ICU	1.3 ± 0.5
Postoperative surgical complication	6 (27.3)
Ileus	3 (13.6)
Wound site infection	2 (9.1)
Bleeding	1 (4.5)
Mortality	1 (4.5)

*ICU: Intensive care unit

According to the anamnesis taken from the patients; It was observed that patients who developed complications in the postoperative period were admitted to the hospital on average 3.5 (2-4) days after the complaints started, and patients who did not develop complications in the postoperative period were admitted to the hospital in 1.2 (1-2) days. The patients were operated on urgently on the day they were admitted to the hospital.

Discussion

MD is a true diverticulum that contains all three layers of the intestinal wall; it is the most common diverticulum in the gastrointestinal tract and should be considered in the acute abdominal differential diagnosis [2]. Although it is seen in approximately 2% of the general population, it was detected at a rate of 0.15%-4.4% in autopsy series. [10]. The disease is usually

diagnosed during surgery in patients who were operated on with the suspicion of acute abdomen. People with MD develop 4% to 6.5% diverticular-associated complications during their lifetime [6]. MD is more common in men and the male/female ratio varies between 2:1 and 4:1 [4, 5]. In this study, male/female ratio was found to be approximately 2.5/1, and these ratios were observed to be similar with the literature.

In the preoperative diagnosis process of MD; One of the most basic imaging methods that can be preferred is USG. However; In cases of clinical suspicion, CT may also be preferred if necessary. CT is recommended, especially in complicated diverticula [11]. In our study; While approximately one-third of the patients only underwent USG; Approximately half of the patients underwent combined USG and CT.

The most common complications of MD have been described in various studies in the literature as intestinal obstruction (30-35%), bleeding (32-40%) and diverticulitis (17-22%) [12, 13]. In this study, 36.4% diverticulitis, 31.8% intestinal obstruction and 22.7% intestinal bleeding were reported. While the rate of patients with intestinal obstruction complications in the study was similar to the literature data, it was determined that there was no similarity to the literature data when the patient population with diverticulitis and intestinal bleeding was evaluated.

It is reported in the literature that risk of developing diverticulum-associated complications in MD is related to the length of the diverticulum and that more complications may develop in cases with a diverticulum length above 2 cm [14]. In this study, patients' mean diverticular length was calculated as 3.0 ± 0.7 cm. Presence of heterotopic tissue is another complication-associated factor. When the literature data were examined, ectopic gastric mucosa was observed at a rate of 25-50% and ectopic pancreatic tissue at a rate of 5-15%. In the presence of these two tissues together, the complication rate increases even more. In particular, it has been reported in studies that it might be associated with intestinal bleeding and ulceration [15-17]. In this study, gastric mucosa was reported in 31.8% of the patients and pancreatic tissue in 4.5% of the patients, and the results were found to be similar to the literature data.

When the literature data were investigated, postoperative complication rate was reported to be approximately 8% in patients operated for MD [18,19]. In this study, postoperative surgical complication rate was calculated as 27.3% and it was found to be higher than postoperative surgical complication rates in similar studies. We are of the opinion that late admission of the patients to the hospital and the presence of diffuse

peritonitis due to perforation in the preoperative period in some patients may be related to this result. As a matter of fact, while the average admission time to the hospital for patients who developed complications in the postoperative period was 3.5 days; The average hospital admission time for patients who did not develop complications in the postoperative period was 1.2 days. In patients who develop complications; We believe that the longer average hospital admission time and the presence of more than one comorbid disease in these patients are effective. Additionally, while no mortality was reported in case series in recent years, a patient in this study died due to septic shock associated with intraabdominal sepsis [20].

Surgical procedure to be preferred in MD is determined according to the general condition of the patient and whether the diverticulum is complicated or not. Diverticulectomy is preferred in uncomplicated diverticula [21]. Small bowel resection was performed in 12 of the patients, 6 patients underwent diverticulectomy and 2 underwent right hemicolectomy, in this study. As seen in the results of our study; Except for uncomplicated diverticulitis cases; Intestinal resection was mostly preferred for patients.

Retrospective design of the study, relatively small patient population, and heterogeneous population that may occur due to the fact that patients are not operated by a single surgeon can be considered among the main limitations.

Consequently, MD is one of the pathologies that should always be kept in mind in the differential diagnosis in acute abdomen. Delay in diagnosis and going unnoticed during surgery increase mortality and morbidity rates, especially in symptomatic patients and pathologies associated with other causes of acute abdomen. MD should always be kept in mind by clinicians in the differential diagnosis of acute abdomen.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

References

1. Lequet J, Menahem B, Alves A, Fohlen A, Mulliri A. Meckel's diverticulum in the adult. *J Visc Surg.* 2017 Sep;154(4):253-259. doi: 10.1016/j.jviscsurg.2017.06.006.
2. Carneiro F, Chaves P, Ensari A. Pathology of the Gastrointestinal Tract, Edition 1, 2017:494.
3. Sagar J, Kumar V, Shah DK. Meckel's diverticulum: a systematic review. *J R Soc Med* 2006;99:501-5.
4. Hansen CC, Søreide K. Systematic review of epidemiology, presentation, and management of Meckel's diverticulum in the 21st century. *Medicine (Baltimore).* 2018 Aug;97(35):e12154. doi: 10.1097/MD.00000000000012154.
5. Kuru S, Kismet K. Meckel's diverticulum: clinical features, diagnosis and management. *Rev Esp Enferm Dig.* 2018 Nov;110(11):726-732. doi: 10.17235/reed.2018.5628/2018.
6. Choi SY, Hong SS, Park HJ, Lee HK, Shin HC, Choi GC. The many faces of Meckel's diverticulum and its complications. *J Med Imaging Radiat Oncol.* 2017 Apr;61(2):225-231. doi: 10.1111/1754-9485.12505. Epub 2016 Aug 4.
7. Dikić S, Dragojević S, Zdravković D, Djordjević M, Kovcin V, Milovanović A. A case of intussuscepted and incarcerated Meckel's diverticulum in to the cecum. *Acta Chir Iugosl.* 2011;58(4):107-9.
8. Hañçerlioğulları O, Buldanlı MZ, Uçaner B, Çiftçi MS, Kesikli SA. Acute appendicitis over the age of 50: The evaluation of the impact of clinical variables on operative and post-operative outcomes. *Ulus Travma Acil Cerrahi Derg.* 2022 Oct;28(10):1419-1427. English. doi: 10.14744/tjtes.2022.86229.
9. Lindeman RJ, Søreide K. The Many Faces of Meckel's Diverticulum: Update on Management in Incidental and Symptomatic Patients. *Curr Gastroenterol Rep.* 2020 Jan 13;22(1):3. doi: 10.1007/s11894-019-0742-1.
10. Rangan V, Lamont JT. Small bowel diverticulosis: Pathogenesis, clinical management, and new concepts. *Curr Gastroenterol Rep.* 2020;22(1):4.
11. Srisajjakul S, Prapaisilp P, Bangchokdee S. Many faces of Meckel's diverticulum and its complications. *Jpn J Radiol.* 2016 May;34(5):313-20. doi: 10.1007/s11604-016-0530-x.
12. Sagar J, Kumar V, Shah DK. Meckel's diverticulum: a systematic review. *J R Soc Med.* 2006 Oct;99(10):501-5. doi: 10.1177/014107680609901011. Erratum in: *J R Soc Med.* 2007 Feb;100(2):69.
13. Bhattarai HB, Bhattarai M, Shah S, Singh A, Yadav SK, Yadav BK, Uprety M, Subedi A, Singh PB, Priya A. Meckel's diverticulum causing acute intestinal obstruction: A case series. *Clin Case Rep.* 2022 Nov 6;10(11):e6518. doi: 10.1002/ccr3.6518.
14. Kamal E. Bani-Hani, Nawaf J. Shatnawi. Meckel's Diverticulum:



- Comparison of Incidental and Symptomatic Cases. *World J. Surg.* 2004; 28: 917–920,
15. Ma P, Cao Y, Gao F, Qiao Z. An uncommon case of gastrointestinal bleeding: Meckel's diverticulum with ectopic gastric mucosa. *Rev Esp Enferm Dig.* 2022 Oct;114(10):624. doi: 10.17235/reed.2022.8831/2022.
 16. Rayan MN, Tang X, Khazem M, Clements W, Bray C. Case for Thought: Meckel's Diverticulum in the Adult Population. *Cureus.* 2022 Apr 26;14(4):e24494. doi: 10.7759/cureus.24494.
 17. Mohammed AA, Rasheed Mohammed M. Emergency Presentations of Meckel's Diverticulum in Adults. *Surg Res Pract.* 2022 Aug 25;2022:6912043. doi: 10.1155/2022/6912043.
 18. Tang XB, Wang X, Ma Y, Bai YZ. Radiological and clinical characteristics of intussuscepted, inverting, and inverted Meckel's diverticulum: A case series. *Eur J Radiol.* 2022 Dec;157:110611. doi: 10.1016/j.ejrad.2022.110611. Epub 2022 Nov 14.
 19. Brenes RA, Abbas HM, Palesty JA, Tripodi G. Difficulty in identifying a bleeding Meckel's diverticulum: case report and review of the literature. *Conn Med.* 2010 Jun-Jul;74(6):333-5.
 20. Izzo P, Messineo D, D'Onghia G, Izzo S, Izzo L. Meckel's diverticulum as an occasional finding during major surgery. What to do? Case report and literature review. *Ann Ital Chir.* 2021 Sep 13;92:S2239253X21036616.
 21. Tree K, Kotecha K, Reeves J, Aitchison L, Noeline Chui J, Gill AJ, Mittal A, Samra JS. Meckel's diverticulectomy: a multi-centre 19-year retrospective study. *ANZ J Surg.* 2023 Feb 23. doi: 10.1111/ans.18351. Epub ahead of print.