Annals of Medicine and Surgery 74 (2022) 103317

Contents lists available at ScienceDirect

Annals of Medicine and Surgery

journal homepage: www.elsevier.com/locate/amsu

Case Report

Meckel's diverticulum abscess in the elderly population: A case report

Aristeidis Ioannidis [a], Georgios Tzikos [a,*], Ioanna Papavasileiou [b], Aikaterini-Vasiliki Touriki [b], Nektaria-Dimitra Doutsini [c], Antonios Michalopoulos [a], Daniel Paramythiotis [a]

[a] 1st Propedeutic Department of Surgery, AHEPA University Hospital, Aristotle University of Thessaloniki, St. Kiriakidi 1, 54621, Thessaloniki, Greece
[b] School of Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece
[c] Medical University of Sofia, Sofia, Bulgaria

ARTICLE INFO

Keywords:
Meckel's diverticulum
Case report
Right lower quadrant abdominal pain

ABSTRACT

Introduction: and importance: Meckel's Diverticulum (MD) is the most usual congenital anatomic abnormality of the gastrointestinal tract. It is present in almost 2% of the population and it rarely becomes symptomatic in adults. Herein, we report a rare case of an elderly woman with MD, its diagnostic algorithm and treatment, pointing out the significance of this pathology in the differential diagnosis of right lower quadrant pain.
Case presentation: A 75-year-old woman presented in the emergency department due to sudden right lower quadrant abdominal pain and fever. After a comprehensive clinical and imaging evaluation, a diagnostic laparoscopy under general was performed. The appendix presented without inflammation, and a MD abscess was found about 50cm from the ileocaecal valve. The resection of the MD abscess, the appendix and the gallbladder (due to synchronous chololithiasis) were performed. The patient had an uncomplicated post-operative course and she was discharged from hospital on the fifth postoperative day after having been fed and mobilized enough.
Clinical discussion: A complicated MD can be a life-threatening situation. Generally, the MD cannot be easily diagnosed through obtaining patient's medical history, clinical examination and laboratory testing and it is undiagnosed to up to 60% of the cases, while it is usually an incidental finding during a diagnostic laparoscopy or laparotomy.
Conclusion: Clinicians should be aware that MD complications in the elderly population can vary. However, having under consideration the very low but true possibility of the MD in the old age may lead to an early and accurate diagnosis.

1. Introduction

Meckel's Diverticulum (MD) is the most usual congenital anatomic abnormality of the gastrointestinal tract and it derives from the incomplete obliteration of the omphalomesenteric canal between the yolk sac and midgut lumen, that normally takes place between the 6th and the 10th week of gestation [1]. It is a true diverticulum of the ileum that consists of all the small intestine layers and sometimes it contains ectopic other type than intestinal mucosa, most often gastric (33%) but also pancreatic (5%), duodenal, colonic, endometrial or even a carcinoid, as well [2,3]. MD lies on the antimesenteric side of the ileum, within 46–91 cm proximal to the ileocaecal valve, measuring between 1 and 10 cm and its vessels come from remnants of the vitelline vessels [4]. It is present in almost 2% of the population and it becomes symptomatic mainly in children within the first two decades of their life and rarely in adults, while the possibility of a symptomatic MD in elderly is found to be insignificant [5]. In this study, we report a rare case of an elderly woman with MD abscess, its diagnostic algorithm and treatment, pointing out the significance of this pathology in the differential diagnosis of right lower quadrant pain. This case report has been reported in line with the SCARE Criteria [6].

2. Presentation of case

A 75-year-old woman from Greece presented in the emergency department of our institution due to sudden abdominal pain located at the right lumbar and right iliac region accompanied by fever over than 38 °C. No defecation disorders or vomiting were mentioned. Her vital signs and her temperature were normal. During physical examination, her abdomen was found to be soft, while there was mild tenderness in the hypogastrium and the right iliac region. McBurney's and Lanz sign were positive and the bowel sounds were present. In her medical history

* Corresponding author. 4 Souliou Str, Kalamaria, Thessaloniki, Greece.
E-mail address: tzikos_giorgos@outlook.com (G. Tzikos).

https://doi.org/10.1016/j.amsu.2022.103317
Received 20 December 2021; Received in revised form 21 January 2022; Accepted 23 January 2022
Available online 26 January 2022

only hypothyroidism under hormonal substitution treatment was mentioned. Besides, no allergies were reported and the patient did not smoke or consume alcohol. Laboratory tests revealed an increase in white blood cells count (11.24 K/μL, normal range: 4.0–11.0 K/μL) with neutrophilic predominance (87.8%, normal range: 40.0–70.0%). Moreover, inflammatory markers were also found to be elevated. C reactive protein was found to be 27.40 mg/dl (normal range 0.0–0.8 mg/dl) and erythrocyte sedimentation rate (ESR) was 47mm/hr (normal range: 0–22 mm/hr for men and 0–29 mm/hr for women). Alvarado score was 7 (Right lower quadrant tenderness: 2 points, rebound tenderness: 1 point, Anorexia: 1 point, Leukocytosis >10,000 cells: 2 points, Leukocyte left shift: 1 point), which was inconclusive for acute appendicitis. Thus, under the differential diagnosis of acute appendicitis, urologic manifestations (kidney stone), acute salpingitis or other ovarian pathology, the patient underwent imaging evaluation with ultrasound, which was equivocal reporting only fluid collection in the pouch of Douglas. Therefore, the patient underwent Computed Tomography (CT) scan of the upper-lower abdomen and retroperitoneal space with intravenous contrast administration. The CT scan report mentioned that: 1) the gallbladder presented full of small stones, without characteristics of inflammation, 2) a 9mm diameter superdense oval formation at the level of the caecum was present which could be possibly a stone while a MD could not be excluded, 3) the appendix was found without dilation or thickening and enhancing of its wall and 4) the sigmoid colon was found with multiple diverticula (Fig. 1).

Due to patient's little clinical improvement during the investigation, but without coming in a definite diagnosis, we decided to admit the patient in our surgical department for close monitoring and conservative treatment with empiric antibiotic therapy (Ciprofloxacin 400mg every 12hr and Metronidazole 500mg every 8hr intravenously). However, the patient's dramatic clinical deterioration during the next day with debilitating right lower quadrant pain despite the conservative treatment, resulted in patient's admission to the operating room. A diagnostic laparoscopy under general endotracheal anesthesia was performed. A 3cm incision was made in the infra-umbilical region, the fascia was observed and incised vertically, and the peritoneum was entered under direct view (Hasson technique) [7]. Then, a 10mm Trocar was inserted in the abdominal cavity through this incision. Gas was inflated producing pneumoperitoneum. After passing by this trocar (No1) the 30° laparoscopic camera, we inspected all the peritoneal cavity and we observed that the appendix presented without inflammation, while a MD abscess was found about 50cm from the ileocaecal valve. The surgeons decided by consensus to proceed to laparoscopic resection of the MD abscess, the gallbladder due to synchronous chololithiasis and the appendix despite the fact that it was not inflamed. As a result, a combination of the usual trocars placement for every type of operation should be performed. Therefore, four more trocars were placed under direct view: 1) a 5mm trocar on the left (No 2) of the umbilicus, 2) a 10mm trocar at the right (No 3) of the umbilicus (both on the midclavicular line), 3) a 10 mm trocar at a distance of 2 cm from the anterior iliac spine (No 4), and 4) a 10mm trocar under the xiphoid process (No 5) (Fig. 2).

Afterwards, we continue with removing the MD with the help of an endoscopic linear cutter/stapler (Fig. 1). Next, we performed the appendectomy. The appendix was grasped and the mesoappendix was exposed by retracting it upwards. The mesoappendix was divided and ligated and finally the appendix was transected with the linear endostappler and removed from the peritoneal cavity. At the final stage of this complicated operation, we proceeded to cholecystectomy. Firstly, we have carefully detached all the gallbladder adhesions with the omentum. Then, the cystic duct and the cystic artery were identified and ligated with metal clips. The gallbladder was completely detached from the liver bed and was removed from the abdominal cavity in a laparoscopic tissue retrieval bag. The duration of the whole operation was 157 minutes. All the surgical specimens (MD, appendix, and gallbladder) were sent for histological examination. The patient had an uncomplicated postoperative course and she was discharged from the hospital on the fifth postoperative day after having been fed and mobilized enough. After 10 days, the patient came for revaluation and we also removed the sutures. She was in perfect clinical condition, the surgical traumas had been healed without any complication and she had already returned to her previous everyday life. The pathology report revealed: 1) On gross

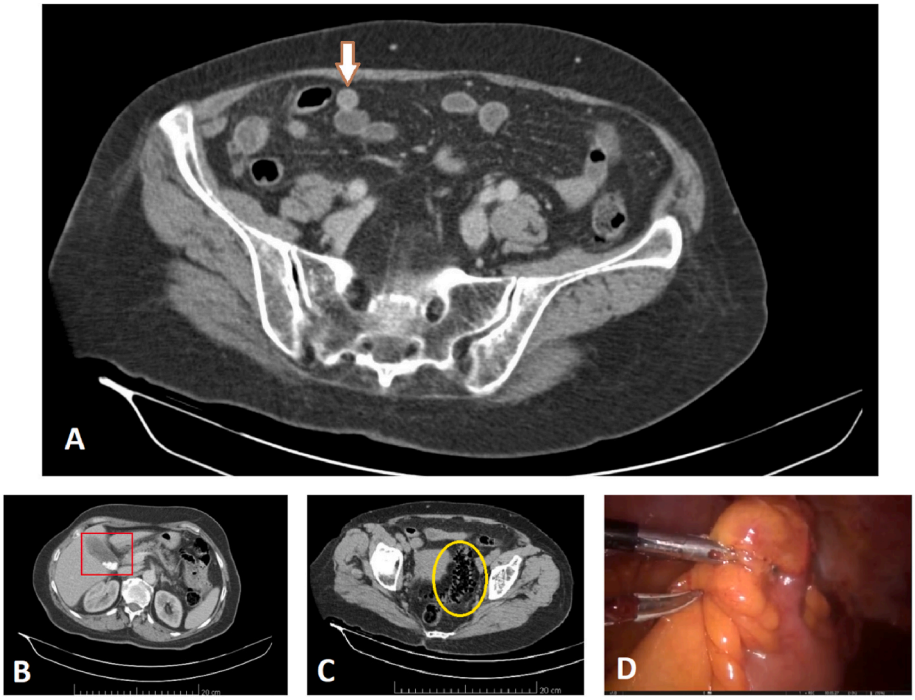

Fig. 1. A: The white arrow indicates the 9mm diameter superdense oval formation at the level of the caecum. B: Multiple diverticula of the sigmoid colon (yellow circle). C: Gallbladder full of small stones without characteristics of inflammation (red square). D: Intraoperative image of the Meckel's diverticulum abscess. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

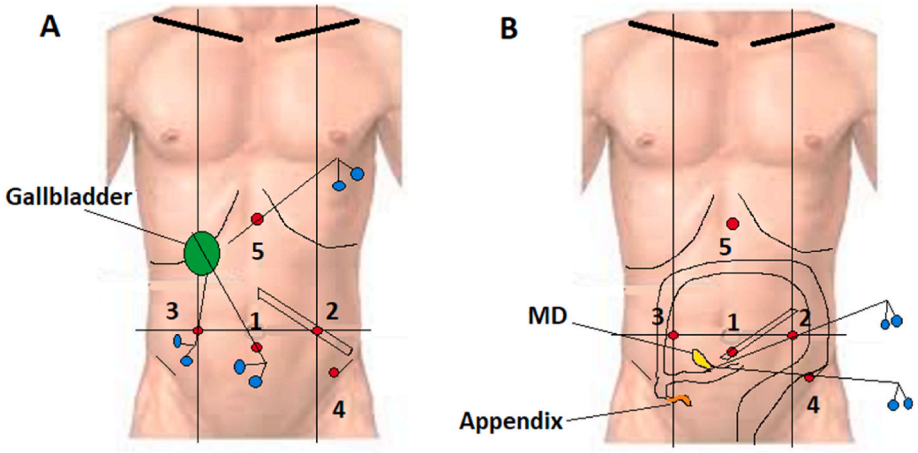

Fig. 2. Trocars placement during the operation. *A: Cholecystectomy*. The camera was inserted via trocar No2, the two graspers for the handling of the gallbladder was inserted via trocars No 1 and 3, dissector was inserted via trocar No 5. *B: MD resection and appendectomy*. The camera was inserted via trocar No 1, graspers and dissector were inserted via trocars No 2 and 4. MD: Meckel's Diverticulum.

examination, the MD was of brownish hue and elastic consistency, 3.6 cm long and 1.6 cm maximum diameter accompanied with fatty tissue in which two reactive nodules (0.1cm and 0.2cm in diameter) were found. Regarding the microscopic findings, the MD was smeared with small intestine mucosa. Moreover, in the submucosa, abundant lymphoid articulations with infiltrating germinal centers were identified, while in the dermis, moderate inflammatory cell infiltration was observed, consisting of lymphocytes, plasma cells, and eosinophilic polymorphonuclear leukocytes. The above inflammatory cellular infiltration extended into the muscularis propria, the serosa, and the adjacent adipose tissue. These histologic findings revealed acute inflammation of the MD without perforation, 2) Gallbladder, 7.8cm long, 3.1cm in maximum diameter with a maximum thickness of 0.4cm, including gallstones of multiple diameters (between 0.4cm and 0.7cm) and shape with one of them being embedded in Hartmann's pouch. Extensive epithelial apoptosis was found and, in the fundus, pyloric metaplasia was seen, while in the dermis there is inflammatory cellular infiltration, consisting mainly of lymphocytes and plasma cells. Lymphoid articulations were observed, as well. All these findings were indicative of chronic cholecystitis due to gallstones. 3) A normal appendix, 4.7cm long and 0.6cm in maximum diameter, accompanied with its mesoappendix. After microscopic evaluation, the mucosa and the submucosa were with prominent lymphoid tissue beneath which the inner circular and the outer longitudinal smooth muscle coats were found, all surrounded by the serosa with adjacent adipose tissue. All these are indicative of a non-inflated appendix.

3. Discussion

In this study, we present a case report of an elderly woman who underwent three types of surgeries simultaneously, due to the need for diagnostic laparoscopy because of an inconclusive diagnosis. She presented with an acute abdomen and an MD abscess was the causative factor after the diagnostic laparoscopy had been completed. Therefore, excision of the MD was performed. Moreover, the surgeons proceeded in laparoscopic cholecystectomy because of synchronous cholelithiasis and appendectomy.

MD, the remnant of the omphalomesenteric duct, is a true diverticulum including all the three coats of the small intestine and presents in various sizes and localization in the last 100cm of the ileum. Although, it can be discovered mainly as an incidental finding during laparotomy or imaging tests for other reasons, when it presents as a complication, it can be a life-threatening situation [8]. The possibility of complications of the MD ranges between 4% and 6.4%, decreasing with age [4,9]. Thus, this possibility is found to be 3.7% at the age of 16 years old, 2% at the age of 30 years old, dropping to zero in the elderly [5]. Among the pathologies of the MD, hemorrhage, bowel obstruction, inflammation, perforation, enterolith formation, intussusception or inversion, torsion, and neoplasm are referred [10]. In adults, the most common manifestations of the MD are bleeding (38%), small bowel obstruction (34%), and diverticulitis (28%), while there are not enough reports in the literature about the elderly [2,11]. Hemorrhage is considered the most common complication, especially in children and males, and it may range from modest episodes of hematochezia to massive bleeding from the anus resulting in life-threatening hypovolemic shock. Bleeding is provoked by ulcerations due to the acid secretion by the gastric mucosa located in the MD in about 75%. This acid production can harm the adjacent mucosa of the ileum, as well [10]. Another potentially serious complication of the MD is inflammation and diverticulitis, as in the case of our patient, which is usually caused by obstruction of the diverticulum orifice, due to a trapped enterolith, fecalith, parasite, neoplasm, foreign body, or fibrosis by an intermittent peptic ulcer and may lead to bowel obstruction or even perforation [4,10–12]. In about 10% of the patients, umbilical anomalies consisting of sinuses, fistulas, cysts, and fibrous bands between the MD and the umbilicus may occur [13]. Additionally, neoplasm of the MD is the least common pathology of the MD, occurring in about 4–5% of complicated MD cases. Leiomyomas, leiomyosarcomas, carcinoids tumors, and fibromas have been reported [14].

The diagnosis of a symptomatic or complicated MD based on the traditional history, the physical examination, and the laboratory results is quite difficult [15]. Some physicians believe that a characteristic that can help them to distinguish the MD from the appendix is that as the inflammation progresses the peritonitis pain is getting localized at the site of the MD instead of the right lower quadrant [16]. Nevertheless, a complicated MD is undiagnosed in up to 60% of the cases, while it is usually an incidental finding during a diagnostic laparoscopy or laparotomy [12,15]. As Meckel's diverticulitis is inflammation in a part of the gastrointestinal tract, patients are presented with abdominal pain (100%), vomiting (50%), tenderness (33%), abdominal distension (33%), and fever (33%) [15]. Imaging tests may not be helpful enough. The typical, but not always noticed, CT finding in Meckel's diverticulitis is a swollen pouch with mural thickening and inflammatory infiltration of the surrounding mesenteric tissue at the level of the terminal ileum [10,17]. Moreover, the diagnosis of bleeding by the MD mucosa may be established with the help of technetium-99 m (^{99m}Tc) pertechnetate radioisotope scanning [18]. However, a complicated MD is usually misdiagnosed as acute appendicitis or terminal ileitis, if the MD is mistaken for a small intestine loop during the imaging testing, especially

in an elderly patient. Therefore, while performing a laparoscopy under the possible diagnosis of acute appendicitis during which the appendix does not seem to be inflamed, it is advisable to search for the presence of an MD [1].

Absolute indications for surgery which consists of MD resection are hemorrhage, diverticulitis, abscess, intestinal obstruction, and umbilicoileal fistulas, while when an MD is found incidentally, then the decision of resecting or not is on the surgeon [19]. In general, resection is indicated for patients younger than 40 years old, when the MD is longer than 2cm or has a narrow neck, in cases of fibrous bands between the MD and the surrounding structures, and in inflamed, thickened MD or when an ectopic gastric tissue is suspected [20,21]. In our case, the indication for resection was based on the macroscopic findings of the MD, and was established after the surgeon had decided the execution of diagnostic laparoscopy for other reasons. The surgeons proceed to a laparoscopic diverticulectomy, rather than segmental intestinal resection. Besides, it is proven that there are no differences in outcomes between these two options [22]. In addition, the surgeons decided to perform also appendectomy, irrespectively the fact that it was found not to be inflated, and cholecystectomy for preventing the patient from future possible complications of her cholelithiasis. Moreover, laparoscopic techniques can easily be performed and are increasingly being used for MD resection, with equivalent outcomes compared to the open approaches [16,23].

The strength of this case report is that is a great example of establishing a certain diagnosis with the help of diagnostic laparoscopy and treating three different pathologies at the same time, preventing the patient from future complications and morbidity. In addition, it emphasizes the true possibility of an MD abscess in people of older age. However, the limitation of the study is that the treatment option been described may not be generalized because performing a diagnostic laparoscopy is not usually feasible for all the elderly, due to the contradictions implied by possible comorbidities, a common condition in this age.

4. Conclusion

In conclusion, as it was mentioned above, MD complications are rare in the elderly population, making misdiagnosis very often. Nonetheless, clinicians must be aware that MD complications in the elderly population can range from acute abdomen to self-limited gastrointestinal symptoms, such as nausea, vomiting, abdominal pain or recurrent small bowel obstruction and therefore it should be considered when other diagnoses are less likely. Knowledge of the clinical features, the imaging findings and the very low but true possibility of the MD in the old age will lead to an early and accurate diagnosis. Laparoscopy plays a significant role when there is an unspecified abdominal manifestation and the available data shows superiority of laparoscopic to open procedures when MD is suspected but the diagnosis is not verified, as it minimizes the time spent for diagnosis, is safe and fast, and decreases the morbidity and mortality in such cases.

Ethical approval

Our case report obtained ethics approval from the ethics committee of our hospital and the patient gave her informed consent to participate.

Sources of funding

No additional funding for the execution of the present study was necessary. The investigators executed the present study without any additional reimbursement.

Author contribution

AI and GT wrote the manuscript and collected the data. DP corrected the manuscript for its scientific basis. IP and A-VT collected the data for the study. DP and N-DD revised the manuscript for grammar and syntax mistakes. AI was the consultant surgeons who operated on these cases. AM was the director of the Department of Surgery and the consultant surgeon who provided the case. All authors have read and approved the final manuscript.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consents is available for review by the Editor-in-Chief of this journal.

Research registration

None declared.

Guarantor

DP accepts full responsibility for the work and the conduct of the study, had access to the data, and controlled the decision to publish.

Availability of data and materials

The data and materials/figures used in the current study are available from the corresponding author on reasonable request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

The authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2022.103317.

References

[1] J.J. Chen, H.C. Lee, C.Y. Yeung, W.T. Chan, C.B. Jiang, J.C. Sheu, et al., Meckel's diverticulum: factors associated with clinical manifestations, ISRN Gastroenterol. 2014 (2014) 390869.
[2] J.J. Park, B.G. Wolff, M.K. Tollefson, E.E. Walsh, D.R. Larson, Meckel diverticulum: the Mayo Clinic experience with 1476 patients (1950-2002), Ann. Surg. 241 (3) (2005) 529–533.
[3] J. Lequet, B. Menahem, A. Alves, A. Fohlen, A. Mulliri, Meckel's diverticulum in the adult, J. Visceral Surg. 154 (4) (2017) 253–259.
[4] Y. Groebli, D. Bertin, P. Morel, Meckel's diverticulum in adults: retrospective analysis of 119 cases and historical review, Eur. J. Surg. = Acta Chirurgica 167 (7) (2001) 518–524.
[5] C.E. Leijonmarck, K. Bonman-Sandelin, J. Frisell, L. Raf, Meckel's diverticulum in the adult, Br. J. Surg. 73 (2) (1986) 146–149.
[6] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.
[7] J.D. Recknagel, L.R. Goodman, Clinical perspective concerning abdominal entry techniques, J. Minim. Invasive Gynecol. 28 (3) (2021) 467–474.
[8] J. Dumper, S. Mackenzie, P. Mitchell, F. Sutherland, M.L. Quan, D. Mew, Complications of Meckel's diverticula in adults, Can. J. Surg. 49 (5) (2006) 353–357.
[9] J.J. Cullen, K.A. Kelly, C.R. Moir, D.O. Hodge, A.R. Zinsmeister, L.J. Melton 3rd, Surgical management of Meckel's diverticulum. An epidemiologic, population-based study, Ann. Surg. 220 (4) (1994) 564–568, discussion 8-9.
[10] Seo-Youn Choi SSH, Hyun Jeong Park, Hae Kyung Lee, Hyeong Cheol Shin, Gyo Chang Choi, The many faces of Meckel's diverticulum and its complications, J. Med. Imag. Radiat. Oncol. 61 (2) (2017) 225–231.
[11] Y. Ding, Y. Zhou, Z. Ji, J. Zhang, Q. Wang, Laparoscopic management of perforated Meckel's diverticulum in adults, Int. J. Med. Sci. 9 (3) (2012) 243–247.

[12] A.A. Feller, J. Movson, S.A. Shah, Meckel diverticulum: a geriatric disease masquerading as common gastrointestinal tract disorders, Arch. Intern. Med. 163 (17) (2003) 2093–2096.
[13] C.J. Chen, W.J. Chen, Meckel's diverticulum and related umbilical abnormalities: review of 26 cases, Taiwan Yi Xue Hui Za Zhi 88 (1) (1989) 23–26.
[14] P. Thirunavukarasu, M. Sathaiah, S. Sukumar, C.J. Bartels, H. Zeh 3rd, K.K. Lee, et al., Meckel's diverticulum–a high-risk region for malignancy in the ileum. Insights from a population-based epidemiological study and implications in surgical management, Ann. Surg. 253 (2) (2011) 223–230.
[15] A. Parvanescu, M. Bruzzi, T. Voron, C. Tilly, F. Zinzindohoué, J.M. Chevallier, et al., Complicated Meckel's diverticulum: presentation modes in adults, Medicine 97 (38) (2018), e12457.
[16] M.A. Hosn, M. Lakis, W. Faraj, G. Khoury, S. Diba, Laparoscopic approach to symptomatic meckel diverticulum in adults, J. Soc. Laparoendosc. Surg. : J. Soc. Laparoendosc. Surg. 18 (4) (2014).
[17] A. Platon, P. Gervaz, C.D. Becker, P. Morel, P.A. Poletti, Computed tomography of complicated Meckel's diverticulum in adults: a pictorial review, Insights Imag. 1 (2) (2010) 53–61.
[18] S.E. Spottswood, T. Pfluger, S.P. Bartold, D. Brandon, N. Burchell, D. Delbeke, et al., SNMMI and EANM practice guideline for meckel diverticulum scintigraphy 2.0, J. Nucl. Med. Technol. 42 (3) (2014) 163–169.
[19] R. McKay, High incidence of symptomatic Meckel's diverticulum in patients less than fifty years of age: an indication for resection, Am. Surg. 73 (3) (2007) 271–275.
[20] R. Rahim, Meckel's diverticulum and indications for resection, Clin. Case Rep. 8 (12) (2020) 3588–3589.
[21] K. Blouhos, K.A. Boulas, K. Tsalis, N. Barettas, A. Paraskeva, I. Kariotis, et al., Meckel's diverticulum in adults: surgical concerns, Front. Surg. 5 (2018) 55.
[22] J.G. Brungardt, B.R. Cummiskey, K.P. Schropp, Meckel's diverticulum: a national surgical quality improvement program survey in adults comparing diverticulectomy and small bowel resection, Am. Surg. 87 (6) (2021) 892–896.
[23] H.S. Jung, J.H. Park, S.N. Yoon, B.M. Kang, B.Y. Oh, J.W. Kim, Clinical outcomes of minimally invasive surgery for Meckel diverticulum: a multicenter study, Ann. Surg. Treat. Res. 99 (4) (2020) 213–220.