ECRONICON OPEN ACCESS

EC PAEDIATRICS
Review Aritlce

Meckel's Diverticulum in Childhood: A Review Article

Volkan Sarper Erikci*

Professor of Pediatric Surgery, Sağlık Bilimleri University, İzmir Faculty of Medicine, Department of Pediatric Surgery, İzmir Tepecik Health and Research Center, Turkey

***Corresponding Author:** Volkan Sarper Erikci, Professor of Pediatric Surgery, Sağlık Bilimleri University, İzmir Faculty of Medicine, Department of Pediatric Surgery, İzmir Tepecik Health and Research Center, Turkey.

Received: October 04, 2021; **Published:** October 28, 2021

Abstract

Meckel's diverticulum is the most common congenital anomaly of the gastrointestinal tract. Majority of cases are asymptomatic and surgical resection is the treatment of choice in symptomatic patients and in cases of complications such as bleeding, intestinal obstruction or Meckel's diverticulitis. In this review article it is aimed to review the clinical manifestations and complications of MD in children under the light of relevant literature.

Keywords: *Meckel's Diverticulum; Children; Complications*

Introduction

Meckel's diverticulum (MD) is the most common congenital anomaly of the gastrointestinal tract. Although it was first reported by Meckel in 1809, Fabricus Hildanus had pictured ileal diverticulum much earlier in 1650 but he failed to describe its embryological origin, so after Meckel's detailed description of this disease, the entity was named as Meckel diverticulum [1,2]. According to Mayo, MD is frequently suspected, often overlooked for and seldom found [3]. In this article it is aimed to analyse the anatomy and embryology, clinical manifestations and complications of MD in children under the light of relevant literature.

Anatomy, embryology and epidemiology

MD is a true diverticulum containing all layers of the small bowel wall [4]. It is usually located on antimesenteric border at terminal ileum. The blood supply comes from two vitelline arteries derived from omphalomesenteric vessels [2]. The persistence of omphalomesenteric duct beyond fetal development gives rise to various anomalies including cysts, fistulae that drain through the umblicus, fibrous bands from the diverticulum to umbilicus predisposing to bowel obstruction [5,6]. But the most common anomaly is MD without any attachment [7].

Traditionally it has been stated that MD can be found in 2% of the general population. However recent studies have shown that this is an overestimate because the real incidence is reported as 0,3 - 1,2% [7-9]. Males and females are equally affected but complications occur more frequently in males [10]. The classical description of the "rule of twos" states that MD occurs in approximately 2% of population with a male to female ratio of 2:1, is located within 2 feet from ileocecal valve, is 2 inches in length [7,11-14]. The life time risk of developing complication is between 2 - 6% and is often seen before the age of 2 years [3,15].

Presentation

Most cases of MD are asymptomatic. In a large series comprising 1476 patients, 86% of cases were asymptomatic [16]. In a recent review of 815 patients aged 18 years or younger who were surgically treated for MD, 60% were found to be asymptomatic [17].

MD can be found incidentally or can present with a variety of clinical manifestations including gastrointestinal bleeding, acute abdominal complaints such as intestinal obstruction, perforation or inflammatory states such as diverticulitis. Those cases with MD that contain ectopic gastric mucosa are generally associated with bleeding. This is in the form of painless lower gastrointestinal bleeding. It is caused by ulceration of small bowel due to acid secretion by ectopic gastric mucosa within the diverticulum. The bleeding site is adjacent to the diverticulum not from within the diverticulum. The abdominal examination is usually normal in children with gastrointestinal bleeding from MD. It has been generally stated that children present more often than adults with bleeding and adults more often than children with symptoms of small bowel obstruction [1,7,18,19].

Ectopic tissue is a common finding in MD. Pluripotent cells located within vitelline duct give rise to ectopic tissue [20]. These tissues are, in order of decreasing frequency gastric, pancreatic, colonic and biliary mucosa [2]. In symptomatic patients, 59% were found to have ectopic tissue while 11% of asymptomatic patients have ectopic tissue [21]. Clinical manifestation of intestinal obstruction related to MD can result from various mechanisms including intussusception, volvulus, torsion, abdominal wall hernia or Meckel's diverticulitis and produces acute abdominal syndrome.

Diagnosis

The bleeding MD can be diagnosed using Meckel's scintigraphy, mesenteric arteriography, double balloon endoscopy and wireless capsule endoscopy [22]. Meckel scan has a sensitivity of 85 - 97%, specificity of 95% in pediatric patients [23]. But false negative studies can occur [23]. It has been reported that those diverticulae that contain ectopic gastric mucosa can be documented by scintigraphic study but MD lacking gastric mucosa will not be seen on a Meckel scan [12,24-26]. Wireless capsule endoscopy or double balloon endoscopy confirms the diagnosis by direct vision and can also identify complications. These diagnostic studies are not recommended in the routine diagnostic work-up for MD but may be reserved in suspicious cases. Laparoscopy may also be used for both diagnosis and surgical management of these cases especially other diagnostic studies are not helpful in diagnosing MD.

Differential diagnosis

In the differential diagnosis of MD any etiology that can cause gastrointestinal bleeding can be the reason for bleeding. Table 1 depicts the other causes of gastrointestinal bleeding in children. These etiologies should be looked for if MD is not documented as the cause of gastrointestinal bleeding and if a definite diagnosis of MD is not possible.

Swallowed maternal blood
Necrotizing enterocolitis
Malrotation with volvulus
Coagulopathy
Hirschsprung's disease
Allergic colitis
Infectious colitis
Anorectal fissure
Lymphonodular hyperplasia
Intestinal duplication
Intussusception
Meckel's diverticulum
Hemolytic uremic syndrome
Henoch-Schoenlein purpura
Juvenile polip
Inflammatory bowel disease

Table 1: *Causes of gastrointestinal bleeding in pediatric age group.*

Treatment

Surgical resection of diverticulum is the treatment of symptomatic MD. This can be performed as a simple diverticulectomy or bowel resection. In patients with MD diagnosed incidentally on imaging studies, elective resection of diverticulum is not suggested [9,11,14,16,27]. Management of normal appearing MD identified during an abdominal exploration is controversial and current literature does not have prospective data supporting resection over no resection. Although some authors suggest leaving incidentally detected MD in situ regardless of age, others recommend resection of all incidentally detected MD. This is because the presence of heterotopic gastric mucosa is a common finding [1,14,28,29]. Besides these authors advocate resection of MD for avoidance of long-term complications namely Meckel's diverticulum associated malignancies and these are carcinoid, adenocarcinoma, gastrointestinal stromal tumor and lymphoma. These authors suggest that the benefits of resection of MD surpass the risks due to the increased incidence of cancer development (30-32). Overall complication rate regarding resection of MD is around 5%. These are surgical site infection, prolonged ileus and anastomotic leak [12,16,24,26].

Conclusion

In conclusion, the spectrum of presentation in children with MD has a wide range. It may remain silent for life time or may cause life threatening complications. MD should be kept in mind in children with painless lower gastrointestinal bleeding, in children with intussusception or recurrent small bowel obstruction, and in patients with features of appendicitis particularly when the appendix vermiformis has been removed previously. Rapid pediatric surgical consultancy should be taken by the front liners of medical providers dealing with these patients and these children should be treated accordingly.

Conflicts of Interest

The author certifies that he has no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding Support

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Author Contribution to the Manuscript

Idea/concept, design, control and processing, analysis and/or interpretation, literature review, writing the article, critical review, references and materials by Volkan Sarper Erikci.

Bibliography

1. Meckel JF. "Uber ide divertikel am darmkanal". *Archives of Physiology* 9 (1809): 421-453.
2. Rattan KN., *et al*. "Meckel's diverticulum in children: our 12-year experience". *African Journal of Paediatric Surgery* 13.4 (2016): 170-174.
3. Mayo CW. "Meckel's diverticulum". *Mayo Clinic Proceedings* 8 (1933): 230.
4. Moore KL and Persaud TV. "The developing human: clinically oriented embryology". 8th edition. Philadelphia: Saunders (2007): 255-286.
5. Passarge E and Stevenson RE. "Meckel's diverticulum". In: Human malformations and related anomalies, 2nd, Stevenson RE, Hall JE (Editions), Oxford University Press, Oxford (2006): 1111.
6. Simms MH and Corkery JJ. "Meckel's diverticulum: its association with congenital malformation and the significance of atypical morphology". *British Journal of Surgery* 67 (1980): 216-219.

7. Yahchouchy EK., *et al*. "Meckel's diverticulum". *Journal of the American College of Surgeons* 192 (2001): 658-662.

8. Williams RS. "Management of Meckel's diverticulum". *British Journal of Surgery* 68 (1981): 477-480.

9. Zani A., *et al*. "Incidentally detected Meckel's diverticulum: to resect or not to resect?" *Annals of Surgery* 247 (2008): 276-281.

10. Quarrie R., *et al*. "Review of the incidence and management of Meckel's diverticulum". *Austin Journal of Surgery* 1 (2014): 1015.

11. Sagar J., *et al*. "Meckel's diverticulum: a systematic review". *Journal of the Royal Society of Medicine* 99 (2006): 501-505.

12. Ueberrueck T., *et al*. "The significance of Meckel's diverticulum in appendicitis- a retrospective analysis of 233 cases". *World Journal of Surgery* 29 (2005): 455-458.

13. Pollack ES. "Pediatric abdominal surgical emergencies". *Pediatric Annals* 25 (1996): 448-457.

14. Soltero MJ and Bill AH. "The natural history of Meckel's diverticulum and its relation to incidental removal. A study of 202 cases of diseased Meckel's diverticulum found in King County, Washington, over a fifteen year period". *The American Journal of Surgery* 132 (1976): 168-173.

15. Schwartz MZ. "Meckel's diverticulum and other omphalomesenteric duct remnants". In: Wyllie R, Hyams JS, editions. Pediatric Gastrointestinal Disease: Pathophysiology, Diagnosis, Management. Philadelphia: Saunders (1999): 483-488.

16. Park JJ., *et al*. "Meckel's diverticulum: the Mayo clinic experience with 1476 patients (1950-2002)". *Annals of Surgery* 241 (2005): 529-533.

17. Ruscher KA., *et al*. "National trends in the surgical management of Meckel's diverticulum". *Journal of Pediatric Surgery* 46 (2011): 393-396.

18. Artigas V., *et al*. "Meckel's diverticulum: value of ectopic tissue". *The American Journal of Surgery* 151 (1986): 631-634.

19. Heldans F and Neff G. "Das maxkelsche divertikel erbgeb". *Revue de Chirurgie Orthopédique* 30 (1937): 227-315.

20. Whang EE., *et al*. "Small intestine". In Schwartz's Principles of Surgery. 8th edition. New York: McGraw-Hill (2005): 1043-1044.

21. McKenzie S and Krantz SB. "Small intestine". In: Sabiston textbook of Surgery. 20th edition. Philadelphia: Elsevier (2012): 1268-1270.

22. He Q., *et al*. "Double-balloon enteroscopy for diagnosis of Meckel's diverticulum: comparison with operative findings and capsule endoscopy". *Surgery* 153 (2013): 549-554.

23. Sinha CK., *et al*. "Meckel's scan in children: a review of 183 cases referred to two pediatric surgery specialist centres over 18 years". *Pediatric Surgery International* 29 (2013): 511-517.

24. Cullen JJ., *et al*. "Surgical management of Meckel's diverticulum. An epidemiologic, population-based study". *Annals of Surgery* 220 (1994): 564-568.

25. Ymaguchi M., *et al*. "Meckel's diverticulum. Investigation of 600 patients in Japanese literature". *The American Journal of Surgery* 136 (1978): 247-249.

26. Stone PA., *et al*. "Meckel's diverticulum: ten-year experience in adults". *Southern Medical Journal* 97 (2004): 1038-1041.

27. Bani-Hani KE and Shatnawi NJ. "Meckel's diverticulum: comparison of incidental and symptomatic cases". *World Journal of Surgery* 28 (2004): 91-20.

28. Kashi SH and Lodge JP. "Meckel's diverticulum: a continuing dilemma?" *Journal of the Royal College of Surgeons of Edinburgh* 40.6 (1995): 392-394.

29. Leijonmark CE., *et al*. "Meckel's diverticulum in the adult". *British Journal of Surgery* 73 (1986): 146-149.

30. Poncet G., *et al*. "Neuroendocrine tumors of Meckel's diverticulum: lessons from a single institution study of eight cases". *The Journal of Gastrointestinal Surgery* 15 (2011): 101-109.

31. Sakpal SV., *et al*. "Krukenberg tumor: metastasis of Meckel's diverticular adenocarcinoma to ovaries". *Journal of Nippon Medical School* 76 (2009): 96-102.

32. Thirunavukarasu P., *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". *Annals of Surgery* 253 (2011): 223-230.

Volume 10 Issue 11 November 2021