ESI Preprints **Not Peer-reviewed**

Radionuclide diagnosis of Meckel's diverticulum: A case report

Arben Dhima
Radiologist, Head of Department of Imaging and Nuclear Medicine, American Hospital, Tirana, Albania
Esilda Trushaj
Radiology resident in the Department of Imaging and Nuclear Medicine, University Medical Center of Tirana "Mother Theresa", Lecturer at the University of Medicine, Tirana, Albania
Amarildo Blloshmi
Radiology resident in the Department of Imaging and Nuclear Medicine, University Medical Center of Tirana "Mother Theresa", Albania

Doi: 10.19044/esipreprint.12.2024.p299

Approved: 20 December 2024
Posted: 23 December 2024

Cite As:
Dhima A.,Trushaj E. & Blloshmi A. (2024). *Radionuclide diagnosis of Meckel's diverticulum: A case report.* ESI Preprints.
https://doi.org/10.19044/esipreprint.12.2024.p299

Abstract

Introduction: Meckel's diverticulum is a common congenital anomaly of the small intestine that results from the incomplete obliteration of the vitelline duct (omphalomesenteric duct). The most common symptom with which a patient presents to the emergency department is painless gastrointestinal bleeding. The most sensitive examination is the Meckel radionuclide scan using 99mTc-pertechnetate (known as the Meckel scan). In this case report, we present the case of an 18-year-old patient who presented with symptoms and was diagnosed with Meckel's diverticulum through the Meckel scan. **Methodology and Discussion:** An 18-year-old male patient presented to the emergency department with hematochezia, abdominal pain for several days, nausea, and vomiting for the first time. After clinical assessment and objective examination, several tests were conducted, which all returned normal results. The clinical suspicion pointed towards Meckel's diverticulum. The diagnosis was confirmed with a very simple examination: scintigraphy, a nuclear study performed by injecting technetium-99m, which

is absorbed by the mucous-producing cells of the ectopic gastric mucosa. The patient underwent laparotomy, and the histopathological examination confirmed the diagnosis of Meckel's diverticulum. **Conclusion:** Scintigraphy is the appropriate diagnostic modality in cases of unexplained gastrointestinal bleeding when there is clinical suspicion of Meckel's diverticulum. It has very high specificity and sensitivity when performed according to protocol. Additionally, it is a low-cost examination with less radiation exposure compared to other imaging modalities.

Keywords: Meckel's diverticulum, nuclear medicine, scintigraphy, technetium-99m, gastrointestinal bleeding

Introduction

Meckel's diverticulum is a common congenital anomaly of the small intestine that results from the incomplete obliteration of the vitelline duct (omphalomesenteric duct). Its prevalence in males is 3-5 times higher than in females and occurs in about 2% of the population. Most patients are asymptomatic, and the most common symptom with which a patient presents to the emergency department is painless gastrointestinal bleeding, as the ectopic gastric mucosa secretes acid that is not neutralized, leading to ulceration. Imaging diagnosis remains challenging. The most sensitive imaging examination is the Meckel radionuclide scan with 99mTc-pertechnetate (commonly known as the Meckel scan).

Objective

In this case report, we present the case of an 18-year-old male patient who presented to the emergency department of American Hospital 3 and was diagnosed with Meckel's diverticulum using the Meckel scan. The objective of this report is to evaluate and demonstrate the importance of scintigraphy in diagnosing this pathology.

Methodology and Discussion

An 18-year-old male patient presented to the emergency department with hematochezia, abdominal pain for several days, nausea, and vomiting. He did not report similar pain in the past, and his medical history showed no previous diseases or surgical interventions. After clinical assessment and objective examination, several tests were performed, including fibrogastroscopy, colonoscopy, abdominal CT without contrast, abdominal CT angiography, and abdominal MRI with contrast, all of which were normal, showing no vascular thrombosis, free peritoneal fluid, contrast extravasation, or signs of intestinal obstruction.

A few days later, the patient underwent a repeat abdominal CT scan, which showed changes indicating intestinal obstruction, with dilated intestinal loops up to 30 mm in diameter. The only diagnostic suspicion remained a segment of the ileum with a hyperdense lumen, suspicious for Meckel's diverticulum.

The diagnosis was confirmed with a very simple examination: scintigraphy, a nuclear study performed by injecting technetium-99m, which is absorbed by the mucous-producing cells of the ectopic gastric mucosa, secreted into the intestinal lumen, and allows for visualization of the diverticulum. The image shows an increased focus of radiotracer activity 5-10 minutes after injection. The intensity of the radiotracer activity varies based on intestinal peristalsis or secretions.

The patient underwent laparotomy, and an ileo-ileal anastomosis was performed at a distance of 50 cm from the ileocecal valve. The histopathological examination confirmed the diagnosis of Meckel's diverticulum with ectopic gastric mucosa.

The technique of performing the Meckel scan is crucial for obtaining the best results, such as stopping medications or procedures that irritate the gastrointestinal tract and premedicating with proton pump inhibitors. A dose between 37 MBq (1 mCi) intravenously is given. The images are taken dynamically, and the examination lasts around 30 minutes. Lateral and oblique views are used to differentiate the diverticulum from renal activity.
When performed correctly, the Meckel scan is an effective method for detecting diverticulum with around 100% sensitivity and specificity. In many studies, it has shown a very low false positive rate and high negative predictive value, preventing unnecessary surgery.

Our patient underwent several expensive and radiation-intensive tests (two abdominal CT scans in a short time period) without diagnostic results. The scintigraphy examination is low-cost, affordable, and fast. When compared to a standard chest X-ray, it has a much lower radiation dose (~30 times lower, 3.33 mSv) but still significantly lower than the dose from an abdominal CT scan (5.56 mSv).

Figure I. Non-contrast CT scan, intestinal bowel with blind end in distal ileum with hiperdense material within

Figure II. Non-contrast CT scan, after 5 days we notice intestinal obstruction

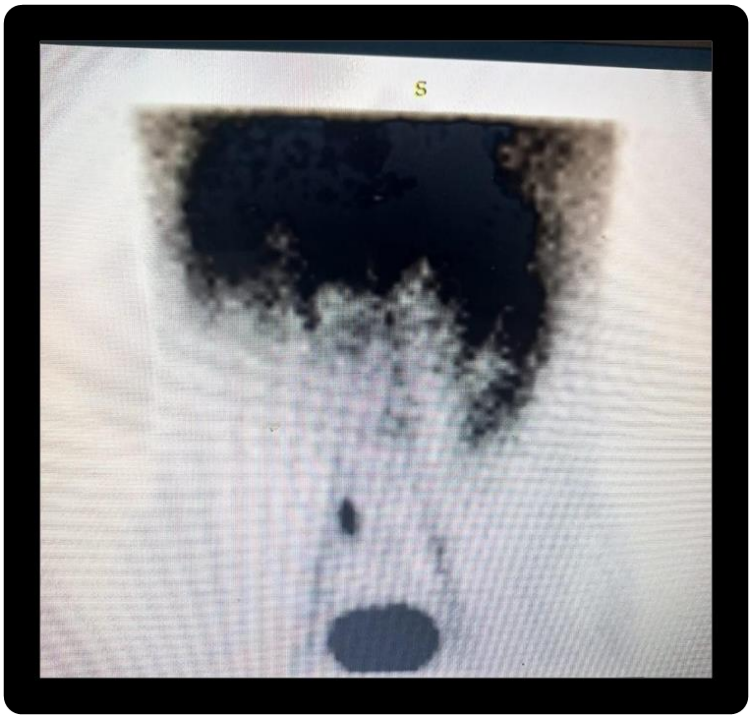

Figure III. Tubular radionucleide focus (Meckel’diverticulum)

Conclusion

The Meckel scan is the appropriate modality in cases of unexplained gastrointestinal bleeding when there is a clinical suspicion of Meckel's diverticulum. To achieve high sensitivity and specificity, pre-procedural and imaging protocols must be strictly followed. Based on numerous studies over the years, if the examination is performed with the correct technique, sensitivity and specificity can reach up to 90%, particularly in children. It is also a low-cost examination with less radiation compared to other imaging tests.

Acknowledgment

We would like to acknowledge and thank A.L., the patient presented in this case, for providing us with permission to use images to help educate future radiologists.

Author contribution

The authors' contributions are as follows: Esilda Trushaj conceived and developed the idea for the paper and revised the manuscript; Arben Dhima contributed to imaging interpretation. Amarildo Blloshmi contributed to medical data collection; All authors read and approved the final manuscript.

Declaration for Human Participants: This study was approved by the ethics committee at the University Medical Center of Tirana "Mother Theresa," and the principles of the Helsinki Declaration were followed. The authors assert that all procedures contributing to this work comply with all the ethical standards. Consent was obtained by the patient in this study.

Conflict of Interest: The authors reported no conflict of interest.

Data Availability: All data are included in the content of the paper.

Funding Statement: The authors did not obtain any funding for this research.

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