Case Report

Laparoscopy in Paediatric Obscure Gastrointestinal Bleeding: A Case of Meckel's Diverticulum and Literature Review

Melina Eleni Baltogianni, Ileana Vasiliki Baltogianni, Foteini Fili, Nikolaos Baltogiannis
Department of Pediatric Surgery, Pediatric Centre of Athens Medical Group of Athens, Greece

Abstract

Obscure gastrointestinal bleeding (OGIB) in children presents a diagnostic challenge, often requiring a multimodal approach when standard imaging fails. We report the case of a 13-year-old boy with severe anaemia and recurrent gastrointestinal bleeding, in whom repeated endoscopic and scintigraphic investigations were inconclusive. Abdominal ultrasound suggested a mass in the right lower quadrant, raising suspicion of Meckel's diverticulum. Diagnostic laparoscopy confirmed the presence of a Meckel's diverticulum, which was successfully resected extracorporeally. Histopathology revealed ectopic gastric mucosa. A literature review highlights the diagnostic limitations of technetium-99m scans and underscores the increasing role of laparoscopy in both diagnosis and treatment. Emerging techniques, such as capsule endoscopy and the evaluation of the predictive value of haemoglobin levels may support early surgical referral. Laparoscopy offers a safe, minimally invasive, and definitive solution, particularly when imaging is inconclusive.

Keywords: Intestinal bleeding, Meckel's diverticulum, Laparoscopy, Childhood

Introduction

Obscure gastrointestinal bleeding (OGIB) refers to persistent or recurrent bleeding from the gastrointestinal tract in the absence of an identifiable source after initial endoscopic and imaging evaluations. In pediatric populations, OGIB often presents with nonspecific signs and requires a tailored diagnostic strategy. Meckel's diverticulum, the most common congenital anomaly of the gastrointestinal tract, occurs in approximately 2% of the population. This true diverticulum, typically located within 60 cm of the ileocecal valve, may harbour ectopic mucosa—most commonly gastric—and can be a leading cause of significant gastrointestinal bleeding in children under four years of age.[1] Despite advances in non-invasive imaging modalities, including Technetium-99m pertechnetate scintigraphy and ultrasonography, the diagnosis of Meckel's diverticulum remains elusive in a significant number of cases, particularly when ectopic mucosa is minimal or necrotic. In such scenarios, laparoscopy has emerged as a valuable tool for both definitive diagnosis and therapeutic management.[2]

We describe the case of a 13-year-old boy with small intestinal bleeding of unknown origin, in whom both diagnosis and treatment were successfully achieved through laparoscopy and review the recent literature of similar cases.

Case Report

A 13-year-old previously healthy boy was urgently referred to our hospital for evaluation of unexplained gastrointestinal bleeding. Physical examination was unremarkable; however, laboratory findings revealed severe anaemia (Hb: 9 g/dL, Hct: 22%) and marked leukocytosis (WBC: 22,500/µL). Previous workup, including emergency gastroscopy, colonoscopy, and two separate Technetium-99m pertechnetate scintigraphy scans performed at the referring hospital, failed to reveal a bleeding source (Fig.1a). Abdominal ultrasonography identified an ovoid mass in the right iliac fossa contiguous with a bowel loop. Given the clinical suspicion of Meckel's diverticulum, the patient underwent diagnostic laparoscopy(Fig.1b).

Both the diverticulum and the appendix were exteriorized and resected via the umbilical port without the use of a stapler (Fig.1c). The postoperative course was uneventful, and the patient was discharged on postoperative day five. The cosmetic outcome was excellent, with a single umbilical incision (Fig.1d).

Resubmitted after revision: 28-05-2026 **Accepted**: 29-05-2026 **Available Online:** 08-11-2026

Access this article online

Quick Response Code:

Website: https://www.afrjpaedsurg.com

DOI: https://doi.org/10.67481/ajps.v23i2.826

Address for correspondence: Nikolaos Baltogiannis
Pediatric Center, Children's Hospital – Athens Medical Group
GR-15121, Marousi, Athens, Greece.
Email: baltnick@gmail.com

Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: editor@afrjpaedsurg.com

How to cite this article: Baltogianni ME, Baltogianni IV, Fili F, Baltogiannis N. Laparoscopy in Paediatric Obscure Gastrointestinal Bleeding: A Case of Meckel's Diverticulum and Literature Review. Afr J Paediatr Surg 2026;23(2) :121-124. https://doi.org/10.67481/ajps.v23i2.826

Histopathology confirmed the presence of ectopic gastric mucosa within the diverticulum.

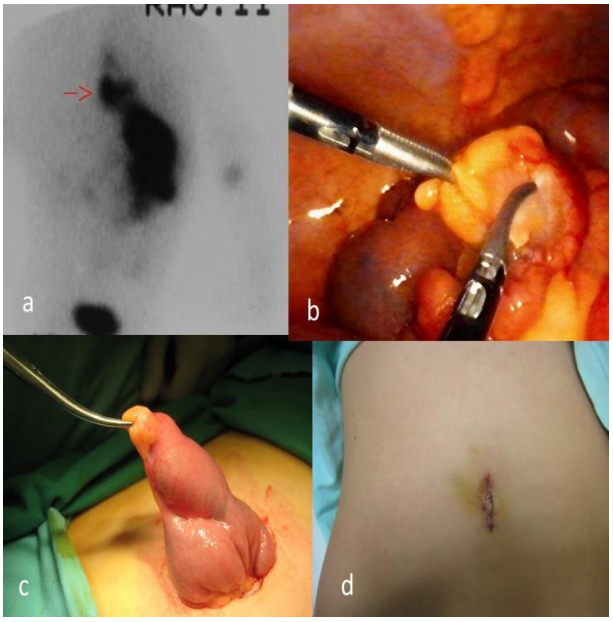


Figure 1. Diagnostic evaluation and laparoscopic management of Meckel's diverticulum. (a) Technetium-99m pertechnetate scan showing equivocal focal uptake without definitive localization. (b) Intraoperative laparoscopic view of the Meckel's diverticulum. (c) Exteriorization of the diverticulum through the umbilical incision for extracorporeal resection. (d) Appearance of the umbilical incision after surgery.

Discussion

Gastrointestinal bleeding in children may arise from a wide range of conditions, including esophageal and gastric varices, polyps, inflammatory bowel disease, vascular malformations, intestinal duplication, trauma, and Meckel's diverticulum.[3-7] Meckel's diverticulum affects 1–3% of the general population and represents the most common congenital anomaly of the gastrointestinal tract, resulting from incomplete obliteration of the vitelline duct during embryogenesis. While often asymptomatic, it can cause bleeding, inflammation, or obstruction. Massive GI bleeding is rare in children, and the bleeding source is typically identified through a structured diagnostic protocol, including clinical assessment, ultrasonography, endoscopy, and Technetium-99m pertechnetate scintigraphy. This scan demonstrates sensitivity ranging from 60% to 95% and specificity of approximately 95%.[7] However, false-negative results may occur when the ectopic mucosa is minimal or necrotic, or in the presence of severe anemia. In our patient, scintigraphy demonstrated equivocal focal radiotracer uptake without definitive localization (Figure 1a), highlighting the diagnostic uncertainty frequently encountered in older children with intermittent bleeding. Although ultrasonography may provide additional clues, its specificity remains limited. This presentation underscores the limitations of non-invasive diagnostic modalities in such cases.

Meckel's diverticulum is frequently discovered incidentally during surgery or after complications.[8-19] Johann Meckel was the first to describe its anatomy and embryological origin in 1809.[10] Clinical presentations include abdominal pain, lower gastrointestinal bleeding (typically caused by ectopic gastric mucosa), and occasionally, bowel obstruction from intussusception or volvulus.[11,12] The bleeding mechanism typically involves ulceration of the adjacent ileum from acid produced by ectopic gastric mucosa. Brown and Azizkhan noted that 95% of bleeding Meckel's diverticula contained such mucosa, with ulceration nearly always evident on histology.[1] Although Technetium-99m pertechnetate scintigraphy significantly improved preoperative diagnosis by detecting ectopic gastric mucosa, its sensitivity is limited by mucosal volume and viability. False negatives are reported in approximately 0.5% of cases, particularly when the ectopic mucosa is necrotic or minimal, while false positives (1.7%) may occur due to intestinal duplication or intussusception.[8,1,13-17]

A 2023 meta-analysis by Yan and Jiang,[18] analysing 1,115 pediatric patients across 16 studies, reported a pooled sensitivity of 80% and specificity of 95% for Technetium-99m scans, with an area under the ROC curve of 0.88. However, high heterogeneity (I^2 = 91.3%) and false-negative rates highlight the test's limitations. Factors such as active bleeding, necrotic mucosa, and suboptimal scan preparation reduced sensitivity. The authors advocate for standardized pre-scan protocols, including fasting, H_2-blocker or PPI pretreatment, and delayed imaging. Nevertheless, they emphasized that Tc-99m scans should not be interpreted in isolation.

Additional diagnostic tools include abdominal ultrasonography and small bowel capsule endoscopy (SBCE).[11,19-21] In a 2024 prospective study, Li *et al*.,[22] evaluated SBCE in 58 paediatric patients with overt GI bleeding, SBCE achieved 82.8% diagnostic accuracy versus 58.3% for Tc-99m scans and 44.8% for ultrasound. In 8 cases with negative scintigraphy, SBCE correctly identified Meckel's diverticulum. When used together, SBCE and scintigraphy increased diagnostic accuracy to 91.7%, highlighting their complementary roles. Haemoglobin levels have also been evaluated as a diagnostic indicator. Swaniker observed reduced detection rates in children with Hb <11 g/dL.[15] In a 2024 cohort by Couselo *et al*.,[23] haemoglobin ≤8.3 g/dL predicted Meckel's diverticulum with ≥99% specificity and a positive likelihood ratio ≥35.8. These findings support the value of severe anaemia as a trigger for further investigation and possible surgical intervention.

In our patient, two negative Meckel's scans and a nonspecific ultrasound preceded diagnostic laparoscopy, which confirmed and treated the pathology during the same procedure. Laparoscopy permits direct abdominal inspection and concurrent therapeutic resection with benefits of faster recovery, minimal scarring, and fewer complications. When Meckel's diverticulum is suspected despite negative imaging, early laparoscopy is warranted.

Internationally [1,24-26] and in Greece, [27,28] the rise of paediatric

laparoscopy over the past five years has established it as an effectivetool for diagnosing and managing intra-abdominal pathology. In cases of obscure small intestinal bleeding, laparoscopy enables diagnosis under direct vision and treatment in the same session, avoiding the need for laparotomy.

In a 2024 series by Jarboa *et al*.,[29] involving 104 patients with Meckel's diverticulum, 12 presented with rectal bleeding. Although laparoscopic exploration was attempted in all surgical cases, 6 required conversion to open procedures due to technical difficulties. Only 8.7% of cases were diagnosed preoperatively by nuclear medicine. Longer diverticula were associated with symptomatic presentations. Morbidity was low (8.1%) and mortality limited to one patient with comorbidities, affirming the safety of resection. Menezes *et al*., in a 16-year retrospective study, evaluated 71 pediatric cases of Meckel's diverticulum.[30] Gastrointestinal bleeding was the most common symptom (55.5%), but 33.3% of those who underwent Technetium-99m scans had false-negative results. Laparoscopy successfully diagnosed and treated 5 of these cases. Histopathology showed ectopic gastric mucosa in 68.3%, often at the diverticular base—raising concerns about the adequacy of diverticulectomy alone. The authors recommend segmental ileal resection when there is doubt. In another 2024 study by Kaihlanen *et al*.,[31] 5 of 7 children with bleeding Meckel's diverticulum had false-negative scans. One case involved a positive scan but negative laparoscopy, with diagnosis confirmed upon re-exploration. This reinforces that clinical suspicion must supersede imaging results, and laparoscopy should be considered early when Meckel's is suspected. Elghazeery *et al*., (2024) reported on 20 paediatric cases managed laparoscopically.[32] Rectal bleeding was the most common symptom (30%). Scintigraphy was accurate in 83.3% of cases. Segmental resection was performed in 90%, with good outcomes and low complication rates. The authors emphasized laparoscopy's cost-effectiveness and ability to avoid staplers and minimize adhesions.

Laparoscopic options include intracorporeal stapled resection and extracorporeal resection through the umbilicus, as performed in our case. As illustrated in Figure 1b,c, a single-incision laparoscopic approach allowed direct identification, exteriorization, and safe extracorporeal resection of the Meckel's diverticulum, without the need for additional ports or stapling devices. This technique minimizes the risk of bowel content spillage and facilitates resection with clear margins, particularly when ectopic mucosa is located at the diverticular base and associated with peptic ulceration.[5,6,33-35]

A 2014 review by Chan *et al*.,[36] underscored laparoscopy's dual diagnostic and therapeutic role. The choice between diverticulectomy and segmental resection should be guided by the diverticulum's anatomy. Broad-based, inflamed diverticula or those with suspected residual mucosa warrant segmental resection, while long, narrow-based diverticula may be safely excised via diverticulectomy. Minimally invasive alternatives such as single-incision laparoscopic surgery (SILS) offer comparable safety with superior cosmetic results. A 2020 review by Redman *et al*. [37] found no significant difference in complication rates between diverticulectomy and segmental resection (3% vs. 6.1%), but noted recurrence in one patient due to residual mucosa. The findings support a selective, anatomy-based strategy. Alemayehu *et al*., (2014)[38] reviewed 14 laparoscopic cases of complicated Meckel's diverticulum. No conversions or major complications occurred. Two cases of adhesive obstruction were treated laparoscopically. These results support the safety and versatility of laparoscopy, even in uncertain or ischemic cases.

Chen *et al*., (2018)[39] reported the largest paediatric cohort to date, including 286 cases of Meckel's diverticulum. Only 24.9% were diagnosed preoperatively, while 42.5% presented with lower gastrointestinal bleeding. Among patients who underwent Technetium-99m scintigraphy, 70.5% tested positive, whereas 23 cases yielded false-negative results. Transumbilical laparoscopic diverticulectomy was performed in 135 patients with excellent outcomes, leading the authors to advocate for routine early laparoscopy in cases of obscure gastrointestinal bleeding. The excellent cosmetic outcome observed in our patient, characterized by a single inconspicuous umbilical incision (Figure 1d), further supports the role of single-incision laparoscopy as a minimally invasive and patient-friendly approach in paediatric obscure gastrointestinal bleeding.

Conclusion

Our case and the reviewed literature confirm the limited reliability of Technetium-99m scintigraphy in diagnosing Meckel's diverticulum. Laparoscopy offers a definitive, minimally invasive approach that enables both diagnosis and treatment within the same procedure. When obscure gastrointestinal bleeding persists despite negative imaging, early laparoscopic exploration should be strongly considered.

Funding

Nil

Conflicts of interest

None to declare

References

1. Brown RL, Azizkhan RG. Gastrointestinal bleeding in infants and children: Meckel's diverticulum and intestinal duplication. Semin Pediatr Surg. 1999;8(4):202-209.
2. Arensman RM. Gastrointestinal bleeding. In Pediatric Surgery. 5th edition, St. Louis: Mosby year Book; Inc 1998;82:1253-56.
3. Spencer R. Gastrointestinal hemorrhage in infancy and childhood: 476 cases. Pediatr Surg int.1996;55:718.
4. Andrassy R. Surgical causes of gastrointestinal bleeding in neonates and children. In Pediatric emergency medicine. Rockville(MD): Aspen Publishers, 1987.

5. Lee KH, Yeung CK, Tam YH, Ng WT, Yip KF. Laparoscopy for definitive diagnosis and treatment of gastrointestinal bleeding of obscure origin in children. J Pediatr Surg. 2000;35(9):1291-93.
6. Echenique M, Dominguez AS, Echenique I, Rivera V. Laparoscopic diagnosis and treatment of Meckel's diverticulum complicated by gastrointestinal bleeding. J Laparoendosc Surg. 1993;3(2):145-8.
7. Spiller RC, Parkins RA. Recurrent gastrointestinal bleeding of obscure origin: report of 17 cases and a guide to logical management. Br J Surg. 1983;70(8):489-493.
8. St-Vil D, Brandt ML, Panic S, Bensoussan A, Blanchard H. Meckel's diverticulum in children: A 20-year review. J Pediatr Surg. 1991;26(11):1289-1292.
9. Turgeon DK, Barnett JL. Meckel's diverticulum. Am J Gastroenterol. 1989;84(7):777-781.
10. Thompson JN, Salem RR, Hemingway AP. Specialist investigation of obscure gastrointestinal bleeding. Gut. 1987;28(1):47-51.
11. Panuel M, Campan N, Delarue A, Petit P, Sarles J, Devred P. Ultrasonographic diagnosis and laparoscopic surgical treatment of Meckel's diverticulum. Eur J Pediatr Surg. 1994;4(6):344-345.
12. Soltero MJ, Bill AH. The natural history of Meckel's Diverticulum and its relation to incidental removal. Am J Surg. 1976;132(2):168-173.
13. Sfakianakis G, Conway J. Detection of ectopic gastric mucosa in Meckel's diverticulum and in other aberrations by scintigraphy. I. Pathophysiology and 10-year clinical experience. J Nucl Med. 1981;22(7):647-654.
14. Sfakianakis G, Haase G. Abdominal scintigraphy for ectopic gastric mucosa: a retrospective analysis of 143 studies. AJR Am J Roentgenol.1982;138(1):7-12.
15. Swaniker F, Soldes O, Hirschi RB. The utility of technetium 99m pertechnetate scintigraphy in the evaluation of patient's with Meckel's diverticulum. J Pediatr Surg. 1999;34(5):760-765.
16. Kong MS, Huang SC, Tzen KY. Repeated technetium-99m pertechnetate scanning for children with obscure gastrointestinal bleeding in children. J Pediatr Gastroenterol Nutr. 1994;18(3):284-287.
17. Torgerson CL, Young DW, Vaid YN. Intestinal duplication: Imagaing with Tc-99m sodium pertechnetate. Clin Nucl Med. 1996;21(21):968.
18. Yan P, Jiang S. Tc-99m scan for pediatric bleeding Meckel diverticulum: a systematic review and meta-analysis. J Pediatr (Rio J). 2023;99(5):425-431.
19. Itagaki A. Double target sign in ultrasonic diagnosis of intussuscepted Meckel diverticulum. Pediatr Radiol. 1991;21(2):148-149.
20. Larson JM, Ellinger DM. Sonographic findings in torsion of a Meckel diverticulum. AJR Am J Roentgenol.1989;152(5):1130.
21. Baldisserotto M, Maffazzoni DR, Dora MD. Sonographic findings of Meckel's diverticulitis in children. AJR Am J Roentgenol 2003; 180(2):425-8.
22. Li L, Zhan X, Chen Y, Li J, Wang Y. Application of small bowel capsule endoscopy in children with Meckel's diverticulum. Eur J Gastroenterol Hepatol. 2024;36(7):845-849.
23. Couselo M, Ibáñez V, Pemartín B, Fonseca R, Vila JJ. Diagnostic value of hemoglobin concentration in identifying Meckel's diverticulum in pediatric lower gastrointestinal bleeding. Pediatr Surg Int. 2024;41(1):50.
24. Boulanger SC, Levitt MA, Graf JL, Brisseau GF, Caty MG, Glick PL. Laparoscopy for small intestinal bleeding in children. Pediatr Endosurg. 2002;6(3):191-194
25. Sackier JM, Berci G, Paz-Partlow M. Elective diagnosis laparoscopy. Am J Surg. 1991;161(3):326-331.
26. Tan HL. The role of laparoscopy surgery in children. Ann Chir Gynaecol. 1994;83:143-147.
27. Papandreou E, Baltogiannis N, Chiotinis H, Livaditi E, Keramidas D. Laparoscopic surgery in children: Initial experience and range of procedures. Laparoscopic Endosc Surg. 2001;3(1):51–52.
28. Papandreou E, Baltogiannis N, Nikolaou S, Keramidas D. The role of laparoscopy in the diagnosis and treatment of benign ovarian disorders. Ann1st Pediatr Clin Univ Athens. 2003;50:156–161.
29. Jarboa L, Zarour A, Mustafa S, Dawdi S, Suliman I, Gutti T, *et al*. The clinical presentation of Meckel's diverticulum: Eight years experience. Turk J Surg. 2024;40(4):343-348.
30. Menezes M, Tareen F, Saeed A, Khan N, Puri P. Symptomatic Meckel's diverticulum in children: a 16-year review. Pediatr Surg Int. 2008 ;24(5):575-7.
31. Kaihlanen K, Phen C, Sengupta A, Diesen D, Fernandes NJ, Rojas I. Meckel's diverticulum: A challenging diagnosis. JPGN Rep. 2024;5(4):423-432.
32. Elghazeery M, Elsharaby A, Abosena W, Mabrouk M, Arafa M. Laparoscopic-assisted resection of complicated Meckel's diverticulum in pediatrics. J Pediatr Endosc Surg. 2024;6:175-182.
33. Teitelbaum DH, Polley TZ, Obeid F. Laparoscopic diagnosis and excision of Meckel's diverticulum. J Pediatr Surg. 1994;29(4):495-497.
34. Lu CC, Huang FC, Lee SY, Huang HY. Laparoscopy diagnosis and treatment excision of bleeding Meckel's diverticulum in a child: report of one case. Acta Paediatr Taiwan. 2003;44(1):41-3.
35. Loh DL, Munro FD. The role of laparoscopy in the management of lower gastro-intestinal bleeding. Pediatr Surg Int. 2003;19(4):266-7.
36. Chan KW, Lee KH, Wong HY, Tsui SY, Wong YS, Pang KY, *et al*. Laparoscopic excision of Meckel's diverticulum in children: what is the current evidence? World J Gastroenterol. 2014;20(41):15158-62.
37. Redman EP, Mishra PR, Stringer MD. Laparoscopic diverticulectomy or laparoscopic-assisted resection of symptomatic Meckel diverticulum in children? A systematic review. Pediatr Surg Int. 2020;36(8):869-874.
38. Alemayehu H, Stringel G, Lo IJ, Golden J, Pandya S, McBride W, *et al*. Laparoscopy and complicated Meckel diverticulum in children. JSLS. 2014;18(3):e2014.00015.
39. Chen Q, Gao Z, Zhang L, Zhang Y, Pan T, Cai D, *et al*. Multifaceted behavior of Meckel's diverticulum in children. J Pediatr Surg. 2018;53(4):676-681.