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CASE REPORT

Massive Gastrointestinal Hemorrhage in an Adult Caused by Meckel's Diverticulum: A Case Report

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Abstract: Meckel's diverticulum is one of the most common congenital anomalies of the gastrointestinal tract in pediatric populations worldwide. Although Meckel's diverticulum itself is usually asymptomatic, patients often present with complications such as gastrointestinal bleeding, Meckel's diverticulitis, intestinal perforation, and other associated symptoms. Notably, Meckel's diverticulum is relatively uncommon in adults, with cases complicated by acute massive gastrointestinal bleeding being particularly rare. We report the case of a 41-year-old man presenting with hematochezia for one day. Upon admission, his hemoglobin level dropped significantly from 98 g/L to 62 g/L within 24 hours. Contrast-enhanced computed tomography strongly suggested contrast media extravasation, indicating active bleeding. Subsequent gastrointestinal endoscopy, including colonoscopy, failed to identify obvious pathological findings. Mesenteric angiography successfully localized the bleeding vessels, but multiple embolization attempts were unsuccessful. The initial imaging and endoscopic modalities may not pinpoint the source of bleeding in this rare condition. Ultimately, a combined laparoscopic and endoscopic approach was employed, which successfully identified and localized the bleeding site in the Meckel's diverticulum. Laparoscopic intestinal resection was then performed, and postoperative pathological examination confirmed Meckel's diverticulum with ectopic gastric tissue. Meckel's diverticulum-induced bleeding in adults is severe yet rare, with nonspecific diagnostic features that often complicate timely identification. In managing the case of massive gastrointestinal hemorrhage, we achieved a successful outcome through combined laparoscopic intestinal resection and endoscopic surgery, with timely diagnosis and targeted intervention leading to complete recovery. This case underscores the critical role of a multimodal diagnostic and therapeutic strategy, particularly the integration of laparoscopy and endoscopy, in overcoming the challenges of nonspecific presentations. It serves as a valuable reference for clinicians, emphasizing that persistent diagnostic uncertainty in severe lower gastrointestinal bleeding should prompt consideration of rare etiologies like Meckel's diverticulum, and that a combined surgical-endoscopic approach can be pivotal in achieving definitive diagnosis and curative treatment.

Keywords: acute gastrointestinal hemorrhage in adults, Meckel's diverticulum, ectopic gastric mucosa, case report

Introduction

Gastrointestinal bleeding (GIB) is a prevalent and clinically significant abdominal disorder characterized by hemorrhage arising from any site along the gastrointestinal tract, from the oral cavity to the anus.[1] Bleeding from above the ligament of Treitz is called upper gastrointestinal bleeding (UGIB),[1] and bleeding from below is called lower gastrointestinal bleeding (LGIB).[2] Acute gastrointestinal bleeding is a significant medical problem worldwide, and patients often present with hematemesis, black stools, hematochezia, anemia, and hemorrhagic shock in severe cases.[3] Prompt identification of the suspected bleeding site in conjunction with aggressive therapeutic interventions is pivotal for achieving favorable outcomes in the management of acute GIB.[4]

Meckel's diverticulum is a true diverticulum located at the end of the ileum because of incomplete closure of the vitelline duct during the embryonic period.[5] Most patients are asymptomatic, and the total lifetime complication rate of Meckel's diverticulum is approximately 4–9%, including hemorrhage, obstruction, and inflammation.[6] It has an independent blood supply from the superior mesenteric artery. Approximately 50% of cases contain ectopic stomach, intestinal mucosa, and pancreatic tissue, which can cause complications.[7] The prevalence of Meckel's diverticulum in

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adults is low, and cases of Meckel's diverticulum with hemorrhage are even rarer.[8] The sporadic, unpredictable clinical presentation of Meckel's diverticulum, compounded by variability in both the disease itself and patient-specific factors, renders the formulation of definitive clinical guidelines particularly challenging. Surgical resection remains the preferred treatment for symptomatic Meckel's diverticulum. Additionally, studies have indicated that surgical resection can also yield benefits for asymptomatic cases of Meckel's diverticulum.[9]

Herein, we present the rare case of acute gastrointestinal bleeding in adults caused by Meckel's diverticulum with ectopic stomach.

Patient Information

Chief complaints: Hematochezia for one day.

History of present illness: A 41-year-old male with no significant medical history presented to the Department of Gastroenterology complaining of hematochezia occurring ten times within a 24-hour period, accompanied by progressive weakness. He reported that the bloody stool was reddish-brown and not bright red, and he had no abdominal pain, nausea, vomiting, anorexia, fever, or weight loss.

History of illness and personal and family history: Young male with no significant medical history.

Physical Examination

Upon admission, the patient exhibited clinical stability, with a body temperature of 36°C, pulse rate of 90 beats/min, and blood pressure of 128/88 mmHg. The patient was awake, alert, and fully conscious. Physical examination revealed signs of normal appearance, absence of lymphadenopathy, hepatosplenomegaly, bone tenderness, jaundice, and no abdominal or rebound tenderness. Examination of the rectum revealed the presence of blood in the rectal vault but no skin tags, external hemorrhoids, or palpable masses.

Laboratory Examinations

On the first day of hospitalization, specifically 2 hours after admission, laboratory findings revealed a white blood cell count of 11,300/μL, a red blood cell count of 3.48×10^6/μL, and hemoglobin level of 9.8 g/dL. Platelet count and C-reactive protein (CRP) levels were within normal reference ranges. Fecal occult blood testing yielded a strongly positive result. Biochemical and coagulation profiles showed no significant abnormalities.

The next day, 24 hours after admission, the patient's blood test demonstrated a marked decline in hemoglobin to 6.2 g/dL and a red blood cell count of 2.19×10^6/μL, whereas the white blood cell, the platelets and the C-reactive protein were all within normal limits. As the consequence of the rapid decrease in red blood cell and hemoglobin levels, the patient exhibited progressive pallor and worsening weakness. To address severe anemia, 200 mL of packed red blood cells was transfused.

Notably, despite immediate intervention, the underlying cause of the patient's bleeding remains elusive, necessitating further diagnostic evaluations to identify the source of the gastrointestinal hemorrhage and guide subsequent management strategies.

Imaging Examinations

Abdominal computed tomography (CT) was immediately performed when the patient was admitted, but it failed to identify any lesions definitively associated with an acute hemorrhage.

On the second day, gastrointestinal endoscopy and colonoscopy were performed to determine the cause of acute hemorrhage. Colonoscopy revealed a massive blood clot in the intestine, whereas upper gastrointestinal endoscopy revealed no abnormalities. Meanwhile, the patient's red blood cell counts and hemoglobin level decreased sharply. Collectively, these findings strongly suggested that the patient's acute massive hemorrhage was attributable to bleeding from the mesenteric artery branch.

After approximately 32 h of admission, the patient's condition remained critical. Despite initial conservative management, the acute gastrointestinal hemorrhage persisted with continuous signs of hemodynamic instability, including persistent hypotension and tachycardia, and an ongoing decline in hemoglobin levels, further confirming the clinical suspicion of an

arterial bleeding origin. Computed tomographic angiography (CTA) of the mesenteric artery was performed to investigate the lesion. The findings revealed Contrast media extravasation was observed in the terminal branch of the ileal artery, a tributary of the ileocolic artery (Figure 1). Transcatheter arterial embolization was subsequently attempted; however, the bleeding site could not be identified during the repeat angiography. Given the patient's deteriorating status, high risk of continuous blood loss, and potential multiorgan dysfunction, immediate surgical intervention was deemed necessary and initiated promptly.

Surgery

The patient was transferred to the general surgery department 33 h after admission and immediately underwent emergency surgery. First, intraoperative laparoscopic exploration was performed, during which no overt intra-abdominal hemorrhage was detected. However, a dark hematoma was identified within the ileum approximately 60 cm proximal to the ileocecal junction. Next, enterotomy was performed at this site, and an endoscope was used for gradual exploration of the cecum. We observed a diverticulum 20 cm away from the ileum, with ulcer bleeding constantly near the diverticulum, which was marked with methylene blue (Figure 2). Finally, using a laparoscopic stapling device, segmental resection of the small bowel encompassing the diverticulum was performed followed by side-to-side anastomosis. Intraoperatively, the patient received a transfusion of 300 mL of packed red blood cells and 700 mL of fresh frozen plasma to maintain hemodynamic stability.

On gross examination, the specimen was approximately 1 cm × 2 cm * 2.2 cm with a central area of ulceration, which was the bleeding spot seen under the endoscope. (Figure 3A). The final pathological report described a diverticulum with gastric heterotopia (Figure 3B).

Final Diagnosis

Combining clinical and pathological reports, a young man was diagnosed with Meckel's diverticulum with ectopic gastric mucosa. The feeding vessels of the Meckel's diverticulum originate from a terminal branch of the ileal artery. Acute massive gastrointestinal bleeding in this patient was due to rupture of the terminal artery in Meckel's diverticulum.

Figure 1 CTA of the mesenteric artery finding the lesion: Extravasation of contrast media was identified in the terminal branch of the ileal artery, a tributary to the ileocolic artery. The yellow arrow indicates the ileal artery, and the red arrow indicates the bleeding point.

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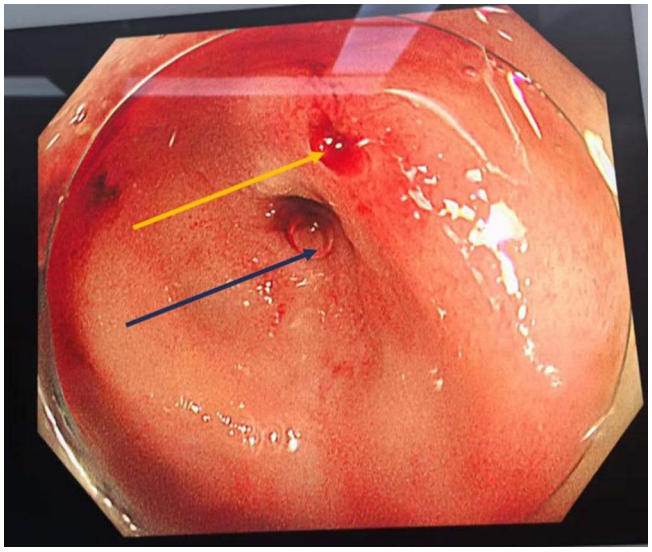

Figure 2 Endoscopy with protruding lesion: During the endoscopic examination, a diverticulum was found 20 cm away from the ileum, with ulcer bleeding constantly near the diverticulum. The yellow arrow indicates the bleeding site, and the blue arrow indicates Meckel's diverticulum.

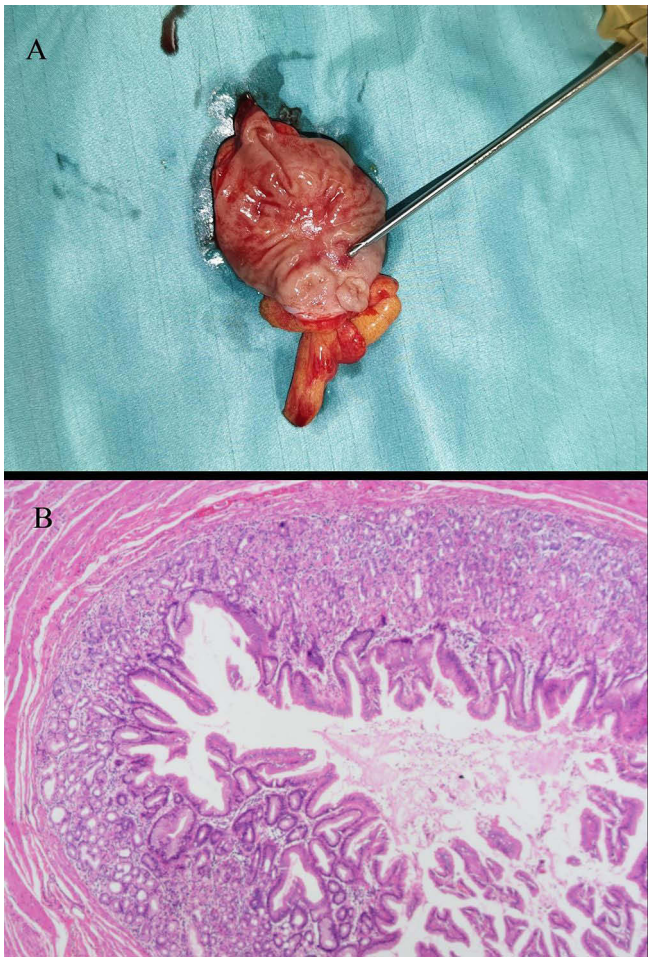

Figure 3 (**A**) Surgical resection specimen; (**B**) Histologic examination of the lesion (x20): a diverticular with ectopic gastric mucosa.

Outcome and Follow-Up

Postoperative blood test results demonstrated progressive recovery of the red blood cell count. Eight hours after surgery, the red blood cell count rebounded to 267×10 units per mm³, which further increased to 288×10 units per mm³ five days postoperatively. Concurrently, hemoglobin levels rose from 7.8 g/dL to 8.4 g/dL, indicating improved oxygen-carrying capacity. The patient experienced an uneventful postoperative course, with stable vital signs and no signs of complications. Fourteen days after surgical intervention, the patient met all discharge criteria and was safely discharged from the hospital. On the 14th day post-discharge, a detailed follow-up assessment was conducted. The patient reported no restrictions in performing daily activities, including self-care, work-related tasks, and mild exercise, and no abdominal discomfort, nausea, vomiting, or other gastrointestinal symptoms. The patient's overall physical condition and quality of life demonstrated a satisfactory recovery, indicating successful surgical management and uneventful convalescence.

Discussion

Meckel's diverticulum is a congenital gastrointestinal disorder that affects approximately 2% of the general population.[10] Meckel's diverticulum is asymptomatic, and people often present with complications including hemorrhage, bowel obstruction, inflammation, perforation, intussusception, volvulus, and malignant transformation.[11]

Currently, diagnosis of Meckel's diverticulum is challenging. Computed tomography (CT) is a common initial diagnostic approach. However, routine non-contrast CT often yields negative results, as reported in previous studies.[12] In contrast, contrast-enhanced CT demonstrates greater diagnostic utility, particularly in cases involving Meckel's diverticulum with gastrointestinal bleeding or ectopic gastric mucosa, providing valuable insights into the anatomical and pathological features of the lesion to some extent.[13]

Diverticulum ectopic gastric mucosal tissues can take up a large amount of ^{99m}Tc, so ^{99m}Tc-Pertechnectate scintigraphy is recognized as the preferred diagnostic method for Meckel's diverticulum with ectopic gastric tissues.[14] Notably, this imaging technique exhibits remarkable diagnostic accuracy, reaching up to 95% in both infants and children.[15] However, in adult patients, the prevalence of ectopic gastric mucosal tissue within the diverticulum is relatively low,[15] which may limit the diagnostic effectiveness of this method in this population.[16] Moreover, a significant challenge lies in the limited availability of the necessary equipment, as many primary healthcare facilities lack the resources to acquire and maintain ^{99m}Tc-Pertechnectate scintigraphy apparatus. This equipment gap not only restricts access to the optimal diagnostic approach but also necessitates the exploration of alternative diagnostic strategies in these settings.

Gastroscopy and colonoscopy can be used to exclude lesions in the upper digestive tract, colon, and rectum. However, these procedures often fail to detect the Meckel's diverticulum, which is typically located in the small intestine.[8] Capsule endoscopy can potentially identify small-intestinal lesions; however, its diagnostic utility for Meckel's diverticulum remains unclear. Additionally, owing to its high cost, capsule endoscopy is not generally regarded as the first-line diagnostic option.[8] In contrast, recent advancements have demonstrated the application of double-balloon enteroscopy for the accurate diagnosis of Meckel's diverticulum. Studies have indicated that this modality outperforms conventional diagnostic methods, offering enhanced visualization and a higher detection rate of the condition.[17]

Angiography can be used to make a definitive diagnosis in patients with severe lower gastrointestinal hemorrhage, but it is only possible to visualize bleeding when the rate is up to a certain value; otherwise, false negatives may occur.[18]

Surgical resection is preferred for the treatment of symptomatic and asymptomatic Meckel's diverticula. A systematic epidemiological analysis of patients with Meckel's diverticulum revealed that those who underwent surgical intervention had significantly lower lifelong risk of complications, as well as lower incidences of both short-term and long-term postoperative complications.[9] With the development of minimally invasive medical technology in recent years, laparoscopic treatment of Meckel's diverticulum and its complications have gradually replaced traditional open surgery.[19] For some diverticula that are difficult to diagnose, laparoscopic exploration has also been prioritized as the best method to confirm diagnosis.[20] In particular, for patients with acute massive hemorrhage, such as in the present case, immediate and accurate diagnosis poses a significant challenge. The urgency of the situation, combined with the limitations of noninvasive diagnostic techniques, often precludes the timely identification of the bleeding source. In such critical scenarios, prompt surgical intervention serves a dual purpose. In addition to addressing the underlying cause of bleeding through direct treatment, it enables a definitive diagnosis. Intraoperative exploration allows for direct visualization of the

affected tissues, facilitating the identification of pathologies such as Meckel's diverticulum, and guiding appropriate surgical management. This approach effectively bridges the gap between diagnosis and treatment, optimizes patient outcomes by minimizing blood loss, and reduces the risk of complications associated with prolonged hemorrhage. Applying laparoscopy to the diagnosis and treatment of Meckel's diverticulum avoids the disadvantages of direct laparotomy, shortens the operation time, reduces patient pain, and lowers the incidence of postoperative complications.

Although the bleeding point was successfully found in this case, in actual clinical practice, if the bleeding is in the intermittent phase and there is no obvious active bleeding on the mucosal surface, both endoscopic and laparoscopic examinations may fail to accurately find the bleeding site, thereby increasing the difficulty of diagnosis. This case failed to fully reflect this diagnostic and treatment challenge. In addition, when a patient has continuous massive bleeding, open surgery has more advantages in terms of surgical field exposure and hemostasis efficiency, and can control bleeding more quickly. In contrast, the combined laparoscopic and endoscopic approach may delay treatment due to problems such as unclear surgical field. In such cases, open surgery would be a better choice.

Conclusion

In this clinical case, the patient was admitted with acute indeterminate gastrointestinal bleeding, which posed a significant diagnostic and therapeutic challenge. By leveraging the expertise of a multidisciplinary team comprising gastroenterologists, surgeons, and radiologists, a comprehensive approach was employed. Through the synergistic use of laparoscopy and endoscopy, we achieved early intervention and definitive management of gastrointestinal hemorrhage caused by a Meckel's diverticulum with ectopic gastric mucosa. This successful outcome not only highlights the efficacy of combined minimally invasive techniques but also underscores the importance of interdisciplinary collaboration in complex cases.

Our report serves as a valuable addition to the existing literature, offering innovative insights and practical strategies for the diagnosis and treatment of Meckel's diverticulum in adult patients. Specifically, it illustrates that maintaining a high index of suspicion for Meckel's diverticulum in such contexts, even in adult populations, supports the timely consideration of surgical intervention. Moreover, the integrated laparoscopic-endoscopic approach demonstrated here offers a pragmatic model for early definitive diagnosis and treatment, potentially reducing risks associated with delayed management. The experience gained from the application of the combined laparoscopy and endoscopy diagnostic and treatment approach in this case can provide certain references for clinical decision-making in other undifferentiated gastrointestinal bleeding cases. When dealing with similar cases of obscure gastrointestinal bleeding, clinicians can consider whether to adopt this combined diagnostic and treatment method based on the patient's specific bleeding conditions, physical status, and other factors. At the same time, they should weigh the applicability of other methods such as open surgery to formulate a diagnosis and treatment plan that is more in line with the actual situation of the patient. Overall, the report contributes valuable insights to inform clinical decisions, optimize surgical timing, and improve outcomes in comparable complex scenarios.

Consent For Publication Statement

The authors confirm that they have obtained written informed consent from the patient for the publication of this manuscript and any accompanying images/identifiable data. The consent documents have been reviewed by the research team and are available for inspection by the journal upon request.

Ethics Statement

Based on the policies of the involved institutions, formal institutional approval is not required for the publication, as this case details do not involve human subjects or identifiable patient information.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

All authors declare that there is no conflict of interest in this work.

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