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Case Report

Enhancing intraoperative precision: transillumination technique for identification of small gut arteriovenous malformation

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ABSTRACT

Arteriovenous malformations (AVMs) in the small intestine, though rare, are significant causes of obscure gastrointestinal (GI) bleeding. This report discusses the use of a transillumination technique to enhance intraoperative localization and precision in the surgical management of a mid-ileum AVM. A 23-year-old male presented with a two-year history of melena and transfusion-dependent anemia. Despite normal findings on upper and lower GI endoscopy, CT enterography revealed multiple tortuous vascular channels in the mid-ileum. Surgical resection was performed, and intraoperative localization of the AVM was achieved using the transillumination technique. Postoperative recovery was uneventful, and the patient remained stable at follow-up. This case highlights the diagnostic challenges of small gut AVMs and the effectiveness of transillumination as a method to enhance intraoperative precision for identifying AVMs, complementing other diagnostic techniques such as CT enterography and video capsule endoscopy.

Keywords: Arteriovenous malformation, Small intestine, Gastrointestinal bleeding, CT enterography, Transillumination, Surgical precision

INTRODUCTION

Arteriovenous malformations (AVMs) of the gastrointestinal (GI) tract are rare vascular anomalies, accounting for up to 40% of cases of obscure gastrointestinal bleeding. These lesions predominantly affect the small intestine and pose diagnostic challenges due to their subtle and non-palpable nature. They often lead to chronic anemia and transfusion dependency if untreated.[1,2]

Advanced diagnostic tools have revolutionized the detection of small bowel AVMs. CT enterography provides detailed imaging of vascular structures and is highly sensitive for detecting lesions not visible through conventional endoscopy.[3] Video capsule endoscopy (VCE) offers complete visualization of the small intestine, making it a first-line tool in obscure GI bleeding cases. However, its inability to provide therapeutic interventions limits its utility. Mesenteric angiography, though less sensitive, remains crucial in identifying active bleeding.[4-6] Surgical resection remains the definitive treatment for small bowel AVMs. Precise intraoperative localization is vital, as small AVMs can be easily missed through visual inspection or palpation alone.

The transillumination technique, which uses an external light source to highlight vascular anomalies, has emerged as a valuable intraoperative tool, improving visualization and enabling complete excision of AVMs.[7,8] This report highlights the integration of advanced imaging and transillumination techniques in managing a rare mid-ileum AVM

CASE REPORT

Patient history

A 23-year-old male, non-diabetic, normotensive, and euthyroid, presented with a two-year history of melena and bleeding per rectum. The patient had experienced easy fatiguability and mild dyspnea on exertion, with progressive pallor observed by his family members. He was not taking any medication.

Clinical examination

Upon examination, the patient was notably pale with a pulse rate of 110 beats/min and blood pressure of 110/70 mmHg. He was afebrile, and other systemic examinations were unremarkable except for systolic murmurs. Per rectal and proctoscopic examinations were significant for melena.

Laboratory findings

The patient's laboratory tests showed hemoglobin of 6 g/dl, white blood cell count of 8.7×10^3/µl, mean corpuscular volume of 77 fl, mean corpuscular hemoglobin of 20 pg, serum iron of 21.58 µg/dl, serum ferritin of 11 ng/ml, total iron-binding capacity of 422 µg/dL, and transferrin saturation of 51%.

His erythrocyte sedimentation rate was 5 mm/hr, platelet count was 166×10^3/µl, and coagulation profile was normal. Stool occult blood test was positive, and chest X-ray and ECG were normal.

Diagnostic imaging

Initial upper GI endoscopy revealed a small gastric polyp, and colonoscopy up to the cecum showed no significant lesions. Given the persistent symptoms, CT enterography was performed. It demonstrated multiple tortuous arterial-phase enhancing vascular channels in the mid-ileum, suggesting an AVM. No active bleeding was identified on mesenteric angiography.

Surgical intervention

The patient underwent laparotomy, during which a small, translucent AVM was identified in the mid-ileum. The lesion was not grossly visible and was non palpable. Due to the difficulty of localization during surgery, the transillumination technique was employed.

A narrow beam of torch light was applied to illuminate the affected portion of the ileum, which helped to precisely locate the AVM as shown in Figure 1.

The lesion and approximately 7 cm of adjacent ileum were resected as shown in Figure 2. End-to-end anastomosis was done using vicryl 2-0 sutures. Histopathological examination confirmed the AVM.

Outcome and follow-up

The patient's haemoglobin stabilized at 10 g/dl post-surgery, and he was discharged on the sixth postoperative day without complications. His haemoglobin levels remained stable at follow-up, with no recurrence of GI bleeding.

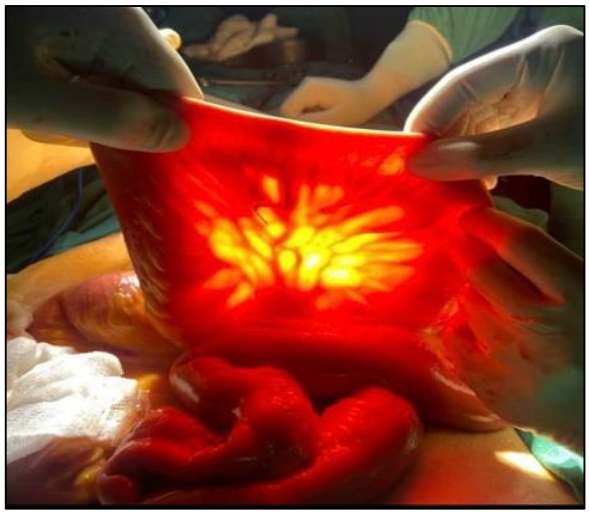

Figure 1: Demonstrating use of transillumination.

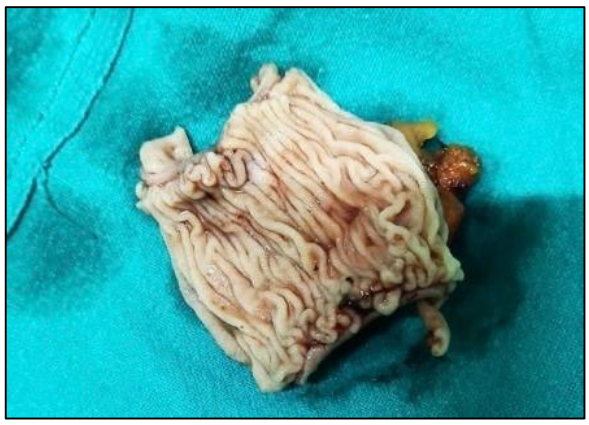

Figure 2: Resected ileum.

DISCUSSION

Small bowel AVMs are a rare but significant cause of obscure GI bleeding. They present unique diagnostic challenges due to their inaccessibility and subtle presentation. CT enterography has become a cornerstone in AVM detection, offering high-resolution imaging that clearly delineates vascular anomalies.[3,4]

Its diagnostic accuracy is particularly valuable in identifying lesions in the small intestine, as demonstrated in this case. VCE has gained prominence as a non-invasive modality for visualizing the small bowel. It is especially useful in detecting vascular malformations, with studies demonstrating its high diagnostic yield in obscure GI bleeding.[5,6] However, its inability to obtain

biopsies or perform therapeutic interventions is a limitation, often necessitating supplementary techniques like CT enterography or mesenteric angiography.[7]

Intraoperatively, traditional methods such as palpation and visual inspection are often insufficient for identifying small AVMs. Techniques like transillumination significantly enhance surgical precision by providing improved visualization of subtle lesions. The utility of this method was evident in the present case, where it enabled accurate localization and complete resection of a mid-ileum AVM.[8,9] Other intraoperative aids, such as double-balloon endoscopy and intraoperative angiography, also contribute to improving outcomes, although they require specialized equipment and expertise.[10,11]

This case underscores the importance of a multimodal approach that integrates advanced diagnostic imaging with innovative surgical techniques like transillumination. Such an approach not only ensures precise localization but also reduces the risk of recurrence and improves postoperative outcomes. Future advancements in imaging and intraoperative tools will likely further refine the management of small bowel AVMs.[12]

CONCLUSION

This study demonstrates the critical role of combining advanced diagnostic imaging with innovative intraoperative techniques for managing obscure gastrointestinal bleeding caused by small bowel AVMs. Specifically, the integration of CT enterography and transillumination allowed precise intraoperative localization and complete resection of a mid-ileum AVM, ensuring optimal surgical outcomes.

By highlighting the utility of the transillumination technique, this case advances knowledge in the field by emphasizing its potential to complement traditional diagnostic modalities. This approach addresses the limitations of conventional intraoperative methods, such as palpation and inspection, which often fall short in identifying small or non-palpable lesions. The findings underscore the importance of a multimodal strategy that bridges the gap between advanced imaging and surgical precision, providing a framework for improved management of rare but significant conditions like small bowel AVMs.

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