

Received: 2026.03.24
Accepted: 2026.05.13
Available online: 2026.07.02
Published: 2026.XX.XX

e-ISSN 1941-5923
© Am J Case Rep, 2026; 27: e953537
DOI: 10.12659/AJCR.953537

Subcentimeter Ileal Neuroendocrine Tumor Resection for Obscure Gastrointestinal Bleeding Followed by Pacemaker-Treated Sick Sinus Syndrome: A Case Report

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEF 1-3 **Jordan Llerena-Velastegui**
AE 1 **Gil Bermeo-Sevilla**
ABEF 1 **Francisco Nunez-Medina**
ABEF 1 **Jose Zambrano-Herdoiza**
EF 2,3 **Ruth Jimbo-Sotomayor** 
G 2,3 **Xavier Sanchez**

1 Hospital Axxis, Quito, Ecuador
2 Pontificia Universidad Católica del Ecuador, Quito, Ecuador
3 Centro de Investigación para la Salud en América Latina (CISEAL), Quito, Ecuador

Corresponding Author: Ruth Jimbo-Sotomayor, Pontificia Universidad Católica del Ecuador, Avenida 12 de Octubre 1076 y Vicente Ramón Roca, 170525, Quito, Ecuador, Phone: +593 99 500 5177, e-mail: rejimbo@puce.edu.ec
Financial support: None declared
Conflict of interest: None declared

Patient: Male, 72-year-old
Final Diagnosis: Neuroendocrine tumor (Grade 1, pT3N1) • overt obscure gastrointestinal bleeding • postoperative sick sinus syndrome
Symptoms: Malaise/fatigue • melena • postoperative syncope • severe bradycardia • vague abdominal discomfort
Clinical Procedure: —
Specialty: Surgery
Objective: Unusual clinical course
Background: Obscure gastrointestinal bleeding (OGIB) denotes recurrent hemorrhage after nondiagnostic bidirectional endoscopy. In overt presentations with suspected small-bowel origin, capsule endoscopy, deep enteroscopy, and multiphase computed tomographic enterography (CTE) can improve lesion detection and operative planning. However, subcentimeter small-intestinal neuroendocrine tumors (siNETs) may remain undetected unless cross-sectional imaging enables targeted exploration.
Case Report: A 72-year-old man presented with 2 days of melena and vague abdominal discomfort in the absence of hematemesis, hematochezia, weight loss, focal pain, or carcinoid features. Esophagogastroduodenoscopy and colonoscopy were nondiagnostic. Multiphase CTE localized an 11 × 8 mm enhancing mural nodule in the distal small bowel. Diagnostic laparoscopy with conversion to a limited laparotomy and intraoperative enteroscopy enabled precise localization, segmental ileal resection with mesentery, primary anastomosis, and appendectomy. Pathology findings comprised a grade 1 siNET measuring 0.8 × 0.6 cm with subserosal invasion, negative margins, and metastasis in 1 of 2 lymph nodes (pT3 pN1, Ki-67 index 2%). The postoperative surgical course was uncomplicated; however, profound bradycardia with syncope unmasked sinus node dysfunction, requiring dual-chamber pacemaker implantation, after which the patient remained clinically stable.
Conclusions: In older patients with overt OGIB and negative bidirectional endoscopy, early multiphase CTE can identify a small hypervascular ileal lesion, guiding targeted intraoperative enteroscopy and oncologic resection. Because nodal metastasis may occur despite a subcentimeter primary tumor, resection should include appropriate mesenteric lymphadenectomy. Vigilant perioperative cardiac rhythm monitoring is warranted because clinically significant bradyarrhythmias may require permanent pacemaker implantation.
Keywords: Gastrointestinal Hemorrhage • Ileum • Neuroendocrine Tumors • Pacemaker, Artificial • Tomography
Full-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/953537>

 3191

 —

 3

 8

Publisher's note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher



Introduction

Obscure gastrointestinal bleeding (OGIB) is defined as recurrent bleeding from an unknown source after standard endoscopic evaluation. A stepwise diagnostic strategy begins with esophagogastroduodenoscopy and colonoscopy, which identify a bleeding source in 48% to 71% of patients. Repeat examination may detect previously missed lesions in approximately one-third of patients with initially negative findings [1]. When OGIB persists, capsule endoscopy and deep enteroscopy extend the evaluation to the mid and distal small bowel. Capsule endoscopy has a diagnostic yield of 61% to 74%, whereas deep enteroscopy enables both direct visualization and endoscopic therapy [1]. In patients younger than 40 years, small-bowel tumors are the most common cause of occult bleeding; vascular ectasias and nonsteroidal anti-inflammatory drug-induced ulcers are predominant in older patients [1]. It is critical to distinguish between overt and occult bleeding, while following a careful stepwise diagnostic approach, because the small bowel often harbors lesions that evade detection on bidirectional endoscopy [1].

Computed tomographic enterography (CTE), including multiphase protocols, has become an important noninvasive modality for evaluating OGIB when conventional endoscopy is non-diagnostic or when a small-bowel neoplasm is suspected. In a large cohort of patients with suspected small-bowel bleeding, multiphase CTE achieved an overall diagnostic yield of 31.6%. The yield was higher in patients presenting with overt bleeding or heme-positive stool (35%) than in those with occult bleeding and iron-deficiency anemia (26%) [2]. CTE is particularly useful for detecting small-bowel masses, with a sensitivity of approximately 90.2% and positive predictive value of 98.2%. Although its sensitivity for vascular lesions is lower (approximately 41.9%), the positive predictive value remains high [2]. Because CTE provides multiplanar reconstructions along with arterial- and portal venous-phase imaging, it can localize hypervascular lesions while facilitating preoperative planning and targeted intraoperative enteroscopy. These capabilities make CTE a valuable complement to capsule endoscopy and deep enteroscopy in the diagnostic algorithm for OGIB.

Small-intestinal neuroendocrine tumors (siNETs) originate from enterochromaffin cells and represent a particularly common neuroendocrine neoplasm. According to the United States Surveillance, Epidemiology, and End Results database, the age-adjusted incidence of siNETs increased from 0.20 per 100 000 population in 1973 to 1.25 per 100 000 in 2012 [3]. Radical surgical resection is the only potentially curative treatment, recommended even in the presence of metastatic disease [4]. Nevertheless, 40% to 75% of patients have disseminated disease at diagnosis [4], and recurrence can occur many years after resection. Disease stage and proliferation index are major risk

factors for recurrence [4]. When radical surgery is not feasible, first-line systemic therapy consists of long-acting somatostatin analogs; other treatment options include peptide receptor radionuclide therapy, everolimus, and local ablative therapies [4]. These epidemiologic and therapeutic considerations underscore the importance of early recognition and complete resection of siNETs presenting with OGIB, given that timely intervention can improve survival and reduce long-term morbidity.

In addition to the challenges of diagnosis and oncologic management, perioperative cardiac complications warrant attention in older patients undergoing abdominal surgery. Sinus node dysfunction encompasses disorders of impulse generation and conduction at the sinoatrial node. Although it can occur at any age, it is most prevalent among adults aged 70 to 89 years [5]. Intrinsic causes include idiopathic degenerative fibrosis, whereas extrinsic causes encompass medications and metabolic abnormalities [5]. Clinical manifestations result from end-organ hypoperfusion; they include syncope, lightheadedness, fatigue, angina, and oliguria [5]. The incidence of sinus node dysfunction (approximately 0.8 per 1000 person-years) is expected to double by 2060; hypertension and chronic kidney disease are shared risk factors [5]. Permanent pacemaker implantation with atrial-based pacing is first-line treatment for symptomatic patients [5]. During major surgery, perioperative bradyarrhythmias are usually mediated by increased vagal tone. Hemodynamically significant cases should be treated with atropine, whereas persistent high-grade conduction disturbances warrant cardiology consultation and consideration of temporary or permanent pacing [6]. Comprehensive care for patients with OGIB caused by a siNET should include meticulous preoperative localization and oncologic resection, as well as vigilant perioperative cardiac assessment and management.

This case illustrates a stepwise diagnostic and operative approach for overt OGIB caused by a siNET, emphasizing the role of CTE, intraoperative enteroscopy, and tailored surgical decision-making, while also documenting an unexpected postoperative bradyarrhythmic complication requiring permanent pacemaker implantation.

Case Report

A 72-year-old Ecuadorian man presented with a 2-day history of melena occurring twice daily, accompanied by vague, non-localized abdominal discomfort and malaise, in the absence of hematochezia, hematemesis, weight loss, focal abdominal pain, or features of carcinoid syndrome. He was a former smoker (approximately 24 pack-years; quit 30 years earlier), had no known drug allergies, and had blood type O Rh-positive. Relevant comorbidities included unstable angina diagnosed 7 years earlier (treated with percutaneous coronary intervention

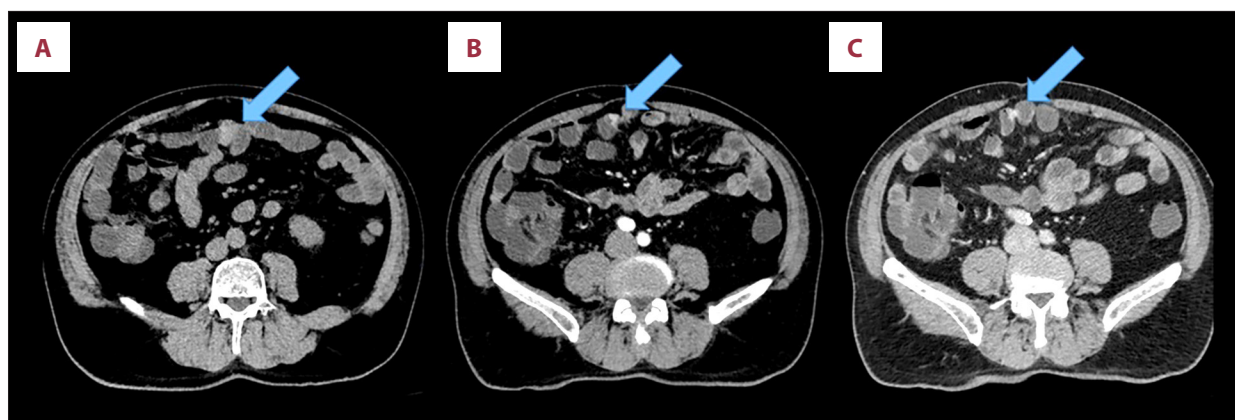


Figure 1. (A) Unenhanced sagittal computed tomography image demonstrating a distal ileal nodular lesion measuring 11 × 8 mm with attenuation of approximately 75 Hounsfield units; no mural thickening, obstruction, lymphadenopathy, or desmoplastic reaction is evident. (B) Arterial-phase and (C) portal venous-phase sagittal computed tomography images demonstrating pronounced arterial hyperenhancement without venous washout, consistent with a hypervascular small-bowel mass and potential source of bleeding.

of the left anterior descending and right coronary arteries) and chronic hypertension. Long-term medications included aspirin 100 mg orally once daily, rosuvastatin 40 mg orally once daily, ezetimibe 10 mg orally once daily, propranolol 20 mg orally twice daily, telmisartan 80 mg orally once daily, and amlodipine 10 mg orally once daily.

Initial evaluation demonstrated positive fecal occult blood tests on 2 consecutive days before presentation. Pre-admission complete blood count and coagulation studies showed a leukocyte count of $4.11 \times 10^3/\mu\text{L}$ (60.3% neutrophils), hemoglobin of 14 g/dL, hematocrit of 40.3%, platelet count of $171 \times 10^3/\mu\text{L}$, prothrombin time of 11.1 seconds, partial thromboplastin time of 23.7 seconds, and international normalized ratio of 1.01. On the day macroscopic bleeding was first observed, the hemoglobin level had decreased to 13.3 g/dL (hematocrit 39%), with a leukocyte count of $3.63 \times 10^3/\mu\text{L}$ (51.4% neutrophils) and platelet count of $158 \times 10^3/\mu\text{L}$, consistent with early blood loss while remaining hemodynamically compensated. Physical examination on admission revealed normal cardiopulmonary findings and a soft, nontender, nondistended abdomen without signs of peritonitis.

Bidirectional endoscopy failed to identify an active bleeding source. Upper endoscopy revealed distal esophagitis with whitish fibrinous exudate, moderate erythematous gastropathy, and superficial erosions lacking ulcer craters or stigmata of recent hemorrhage. Colonoscopy showed scattered diverticula in the descending and sigmoid colon, as well as 2 non-bleeding sigmoid polyps (1 sessile and 1 semipedunculated); no fresh or altered blood was evident in the lumen. Given the ongoing melena and nondiagnostic results of esophagogastroduodenoscopy and colonoscopy, the working diagnosis was overt OGB originating from the small bowel.

Same-day contrast-enhanced CTE identified a solitary mural nodule measuring 11 × 8 mm in the distal small bowel. The lesion was intrinsically hyperattenuating on noncontrast images (approximately 74–75 Hounsfield units), demonstrated avid arterial-phase enhancement (approximately 117 Hounsfield units), and showed persistent enhancement during the portal venous phase (approximately 134 Hounsfield units) without washout. There was no frank stenosis, diffuse mural thickening, ascites, or abdominopelvic lymphadenopathy. Multiplanar reconstructions localized the lesion to the mesogastrium, favoring the distal jejunum or ileum; 3-dimensional reconstruction facilitated preoperative mapping for surgical orientation (Figure 1A–1C). Given the hypervascular appearance and radiologic evidence suggesting intraluminal blood products, a small-bowel neoplasm, particularly a well-differentiated neuroendocrine tumor, was considered the leading diagnosis. Operative management was pursued due to overt bleeding, nondiagnostic bidirectional endoscopy, and radiologic localization of a solitary hypervascular small-bowel lesion suspicious for neoplasm; resection was expected to be diagnostic and therapeutic.

Preoperative cardiology assessment showed no absolute contraindication to general anesthesia or abdominal surgery. In accordance with secondary prevention guidelines and the anticipated procedural bleeding risk, aspirin 100 mg daily was withheld for 5 days before surgery, with plans for postoperative resumption under cardiology guidance. Given the patient's history of coronary artery disease, baseline bradycardia, and antiplatelet therapy, perioperative planning focused on balancing bleeding risk, cardiovascular protection, and the need for definitive treatment of the suspected small-bowel lesion. On the morning of surgery, vital signs were as follows: blood pressure, 111/69 mm Hg; heart rate, 49 beats/min; respiratory

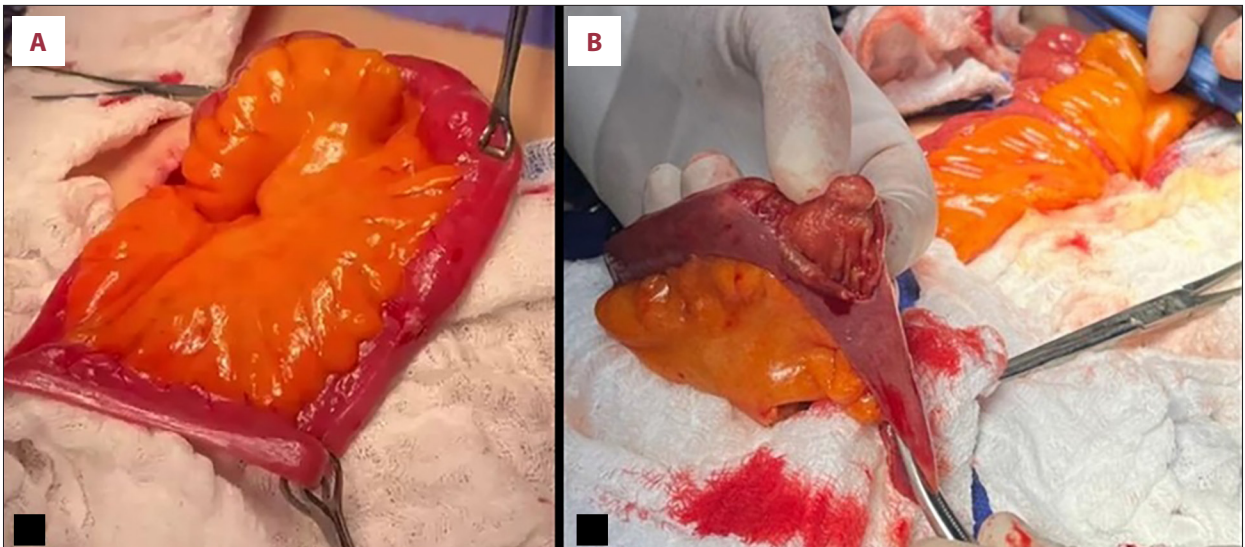


Figure 2. Intraoperative images. (A) Exteriorized ileal loop opened longitudinally, showing povidone-stained mucosa with well-defined circular folds and retracted edges. (B) Serosal view of terminal ileum demonstrating a firm subserosal-transmural antimesenteric nodule; the adjacent mesenteric fold and planned wedge resection site are visible.

rate, 18 breaths/min; temperature, 36.2 °C; and oxygen saturation, 89% on room air. General, neurologic, cardiopulmonary, and abdominal examinations were otherwise unremarkable.

A minimally invasive approach was initially pursued to optimize recovery and visualization. Diagnostic laparoscopy was performed through a 1-cm supraumbilical longitudinal incision and 2 additional 5-mm ports in the right and left flanks. Exploration began at the ileocecal valve and proceeded approximately 2.5 m proximally along the small bowel. To allow systematic bimanual examination and more precise lesion localization, the procedure was subsequently converted to a midline laparotomy by extending the supraumbilical incision into a 10-cm supra- and infraumbilical midline incision. This conversion was undertaken as a deliberate localization strategy rather than because of hemorrhage, hemodynamic instability, or operative complication. Open exploration revealed no macroscopic evidence of carcinomatosis or lymph nodes suspicious for malignancy. A firm, exophytic, approximately 1-cm transmural nodular mass was identified in the small bowel, with central fibrin-covered ulceration, no active bleeding, and retraction of the adjacent serosa (**Figure 2**). Segmental ileal resection was performed, including the corresponding mesentery and 10-cm proximal and distal margins. The resection specimen measured 8.0 cm in length; an additional 4.0-cm bowel segment was submitted separately. Two perilesional lymph nodes measuring 0.3 and 0.4 cm were isolated for histopathologic evaluation. Intraoperative enteroscopy was subsequently performed to screen for synchronous small-bowel lesions and enable complete assessment of the remaining bowel. The proximal small bowel was normal to the ligament of Treitz. In the distal bowel, only 2 small lymphangiectasias

and manipulation-related ileitis were identified; no additional tumors were detected. Reconstruction was completed with a hand-sewn, isoperistaltic, end-to-end ileoileal anastomosis using absorbable 3-0 Vicryl suture. Because the appendix measured approximately 10 cm and demonstrated circumferential thickening and induration of its distal third—measuring up to 1.5 cm despite a smooth, regular serosal surface—conventional appendectomy was performed to exclude a synchronous appendiceal lesion. The mesoappendix was divided from tip to base using an ultrasonic dissector. One distal and 2 proximal polymer clips were placed across the appendiceal base, the appendix was divided with a cold blade, and the appendiceal stump was secured with the proximal clips, then inspected to confirm hemostasis and integrity.

Histopathologic examination confirmed a well-differentiated grade 1 siNET measuring 0.8 × 0.6 cm with subserosal invasion; 0 mitoses per 2 mm²; negative proximal, distal, and radial margins; and no lymphovascular or perineural invasion. Of the 2 examined lymph nodes, 1 contained metastatic disease (largest deposit, 0.3 cm), establishing a pathologic stage of pT3 pN1 according to the American Joint Committee on Cancer/Union for International Cancer Control staging system, 8th edition. Immunohistochemistry demonstrated diffuse cytoplasmic positivity for chromogranin and synaptophysin, with a Ki-67 labeling index of 2%, confirming a low-grade neuroendocrine neoplasm (**Figure 3A, 3B**). The additional small-bowel segment was histologically unremarkable, and the appendix showed diverticulosis without evidence of neoplasia.

The immediate postoperative course was notable for severe bradycardia (approximately 28 beats/min), requiring monitored

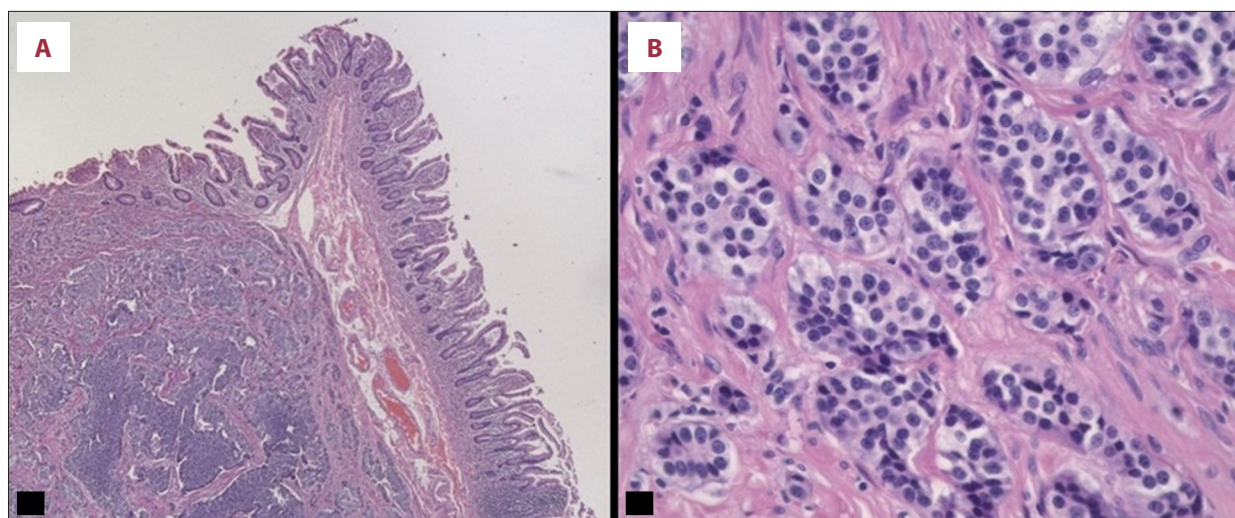


Figure 3. Histopathology findings. (A) Hematoxylin and eosin stain, original magnification $\times 10$, showing an ileal segment with a basophilic solid focus and mucosal erosion; an organoid neoplasm infiltrates the mucosa, submucosa, muscularis propria, and subserosa, with prominent peritumoral desmoplasia. (B) Hematoxylin and eosin stain, original magnification $\times 100$, demonstrating monomorphic cells with salt-and-pepper chromatin and moderate granular eosinophilic cytoplasm arranged in solid and trabecular/cord-like nests. Desmoplastic stroma is present; no pleomorphism, necrosis, or mitotic figures are identified.

care, followed by 2 additional episodes of profound bradycardia associated with syncope lasting 10 to 15 seconds. A subsequent 17-hour Holter recording demonstrated a minimum heart rate of 21 beats/min, as well as findings consistent with sinus node dysfunction and sick sinus syndrome. Because the episodes were recurrent and symptomatic, cardiology consult recommended permanent pacemaker implantation after evaluation for reversible perioperative causes. A dual-chamber pacemaker (active-fixation right atrial and right ventricular leads; Abbott Tendril STS 2088 TC MRI, 52/58 cm, connected to an Abbott Endurity Core generator) was implanted under local anesthesia without complications. Postprocedural chest radiography confirmed appropriate lead and generator positioning without pneumothorax; it also demonstrated a prominent calcified aortic knob, bibasilar subsegmental atelectasis, and probable calcified granuloma in the right lung base. Telemetry remained stable thereafter, without further episodes of low-output symptoms or arrhythmia.

The gastrointestinal postoperative course was uncomplicated. Bowel function returned as expected, the anastomosis remained clinically intact, and surgical wounds healed appropriately. At discharge, the patient was hemodynamically stable, device interrogation was satisfactory, and surgical recovery was uneventful. He was discharged home with instructions for coordinated outpatient follow-up with general surgery and cardiology services, resumption of secondary cardiovascular prevention under cardiology guidance, and surveillance for node-positive, well-differentiated siNET after resection. This case emphasizes that, in patients with overt OGIB and

nondiagnostic bidirectional endoscopy, contrast-enhanced CTE can localize a small hypervascular culprit lesion; a judicious combination of limited laparotomy and intraoperative enteroscopy enables definitive oncologic resection while expediting diagnosis. It also highlights the importance of vigilant perioperative cardiac monitoring to identify and treat clinically significant postoperative bradyarrhythmias.

Discussion

This case illustrates how a focused diagnostic strategy can identify a subcentimeter siNET underlying overt OGIB. Bidirectional endoscopy is nondiagnostic in up to half of patients with OGIB, and multiphase CTE is increasingly incorporated into the diagnostic algorithm because it provides arterial- and portal venous-phase imaging along with multiplanar reconstructions [2]. In a cohort of 1087 patients, the overall diagnostic yield of multiphase CTE was 31.6%; it was significantly higher in patients with overt bleeding or heme-positive stool (approximately 35%) than in those with iron-deficiency anemia alone. The sensitivity and positive predictive value for detecting small-bowel masses were 90.2% and 98.2%, respectively [2]. Rather than repeating the entire diagnostic algorithm, the present case highlights the practical value of CTE in patients with persistent overt bleeding after negative bidirectional endoscopy when a small-bowel mass is suspected. In our view, these findings support prioritizing multiphase CTE in this setting because subtle hypervascular lesions may otherwise remain undetected, delaying definitive treatment. In the

present case, multiphase CTE identified an 11 × 8 mm hyper-enhancing distal small-bowel nodule, enabling targeted intra-operative enteroscopy and segmental resection.

The indolent nature of siNETs belies their malignant potential. Epidemiologic analysis has shown that the age-adjusted incidence of siNETs in the United States increased from 0.20 per 100 000 population in 1973 to 1.25 per 100 000 in 2012 [3]. Despite their small size, these tumors frequently metastasize: approximately 40% to 75% of patients have disseminated disease at diagnosis [4], and retrospective data suggest that siNETs have greater malignant potential than other neuroendocrine neoplasms regardless of primary tumor size [7]. Consequently, approximately 80% of patients present with regional lymph node metastases, and more than one-third have hepatic metastases [7]. Our patient's 0.8-cm grade 1 lesion demonstrated subserosal invasion and nodal metastasis, underscoring that lymphatic spread can occur even when the primary tumor is smaller than 1 cm and emphasizing the need for complete oncologic resection when small-bowel masses are identified. Importantly, nodal metastasis should not be regarded as an isolated microscopic finding in this setting. Rather, it raises concern for occult regional, hepatic, or extrahepatic disease not evident on initial imaging, thus supporting structured postoperative staging and long-term surveillance.

Radical surgical resection—the only curative treatment for siNETs—should include the primary tumor, associated mesentery, and involved lymph nodes [7]. Cross-sectional imaging can identify mesenteric lymphadenopathy as a surrogate marker of an otherwise undetected primary lesion. However, conventional computed tomography protocols detect fewer than half of primary siNETs, whereas CTE increases sensitivity to approximately 85% [7]. Because multifocal tumors occur in 20% to 44% of patients, careful intraoperative assessment (including palpation of the entire small bowel when feasible) remains essential for lesion localization and exclusion of additional tumors [7]. In the present case, diagnostic laparoscopy followed by limited laparotomy with intraoperative enteroscopy enabled precise localization and R0 resection while avoiding extensive small-bowel resection and preserving bowel length. Given the presence of nodal metastasis despite a subcentimeter primary tumor, local excision alone would have been inadequate; thus, the operative strategy appropriately favored segmental resection with the corresponding mesentery. Appendectomy was also performed to exclude a synchronous appendiceal lesion because synchronous or metachronous neoplasms occur in up to 29% of patients with siNETs [7].

Beyond oncologic considerations, perioperative cardiac assessment is critical in older adults undergoing abdominal surgery. Sinus node dysfunction (also termed sick sinus syndrome) encompasses intrinsic and extrinsic disorders of

impulse generation at the sinoatrial node. Intrinsic causes include degenerative fibrosis and ischemia, whereas extrinsic causes consist of medications and metabolic disturbances [5]. Epidemiologic data indicate that sinus node dysfunction is most prevalent in individuals aged 70 to 89 years, with an incidence of approximately 0.8 per 1000 person-years and shared risk factors that include hypertension and chronic kidney disease [5]. First-line treatment for symptomatic sinus node dysfunction is permanent pacemaker implantation with atrial-based pacing [5]. Neuroendocrine tumors may influence heart rate and hemodynamics through the release of vasoactive mediators, particularly in the setting of carcinoid syndrome, carcinoid crisis, or advanced metastatic disease. Accordingly, tumor manipulation or resection may theoretically contribute to perioperative hemodynamic instability. In our patient, however, a direct hormone-mediated effect was considered unlikely because he had no preoperative carcinoid symptoms (eg, flushing, diarrhea, bronchospasm, or labile blood pressure) and lacked hepatic lesions or abdominopelvic lymphadenopathy on initial CTE. Instead, the postoperative course was characterized by recurrent profound bradycardia with syncope and Holter-confirmed sinus node dysfunction, rather than transient vasomotor crisis. Furthermore, postoperative bradycardia progressed to symptomatic sick sinus syndrome requiring dual-chamber pacemaker implantation. Although this complication was unexpected given the absence of documented preexisting rhythm disturbances, underlying sinus node dysfunction may have been unmasked by baseline bradycardia, beta-blocker therapy, surgical stress, and vagal stimulation. Clinicians should maintain a high index of suspicion for perioperative bradyarrhythmias and promptly treat hemodynamically significant episodes with atropine, the recommended first-line therapy for symptomatic bradycardia [8], followed by consultation for temporary or permanent pacing as indicated.

This case highlights several important implications for clinical practice. First, negative bidirectional endoscopy does not exclude a surgically amenable small-bowel lesion; early multiphase CTE combined with intraoperative enteroscopy can facilitate detection and complete resection of subcentimeter siNETs. Second, the presence of nodal metastasis in a tumor smaller than 1 cm supports current recommendations for oncologic resection (rather than local excision) and should prompt thorough postoperative evaluation for occult metastatic disease. Third, vigilant perioperative cardiac monitoring is essential in older patients, particularly those receiving beta-blockers; early recognition and management of sinus node dysfunction may prevent syncope or sudden cardiac death. Limitations of this report include its single-case design, which precludes determination of a causal relationship between surgery and sick sinus syndrome; it also limits generalizability. Furthermore, although permanent pacemaker implantation was lifesaving in our patient, the long-term prognosis of siNETs with nodal

metastasis remains guarded and requires multidisciplinary follow-up. Future research should evaluate the cost-effectiveness of routine multiphase CTE for OGIB; develop risk stratification models to identify patients most likely to benefit from early surgical intervention; determine the prevalence of occult hepatic or extrahepatic disease in patients with node-positive subcentimeter siNETs; and explore mechanisms linking surgical stress, neuroendocrine mediator activity, and autonomic changes to postoperative sinus node dysfunction.

Conclusions

In older patients with overt OGIB and nondiagnostic bidirectional endoscopy, a subcentimeter siNET should be considered, particularly when multiphase CTE identifies a small hypervascular small-bowel lesion. Our experience in the present case suggests that targeted operative exploration, intraoperative enteroscopy, and oncologic resection with appropriate mesenteric lymphadenectomy can be effective even for subcentimeter tumors because nodal metastasis may already be present.

References:

1. Bull-Henry K, Al-Kawas FH. Evaluation of occult gastrointestinal bleeding. *Am Fam Physician*. 2013;87:430-36
2. Deepak P, Pundi KN, Bruining DH, et al. Multiphase computed tomographic enterography: Diagnostic yield and efficacy in patients with suspected small bowel bleeding. *Mayo Clin Proc Innov Qual Outcomes*. 2019;3:438-47
3. Dasari A, Shen C, Halperin D, et al. Trends in the incidence, prevalence, and survival outcomes in patients with neuroendocrine tumors in the United States. *JAMA Oncol*. 2017;3(10):1335-42
4. Slott C, Langer SW, Møller S, et al. Outlook for 615 small intestinal neuroendocrine tumor patients: Recurrence risk after surgery and disease-specific survival in advanced disease. *Cancers (Basel)*. 2024;16:204
5. Hawks MK, Paul MLB, Malu OO. Sinus node dysfunction. *Am Fam Physician*. 2021;104:179-85
6. Pecha S, Kirchhof P, Reissmann B. Perioperative arrhythmias. *Dtsch Arztebl Int*. 2023;120:564-74
7. Kupietzky A, Dover R, Mazeh H. Surgical aspects of small intestinal neuroendocrine tumors. *World J Gastrointest Surg*. 2023;15:566-77
8. Patel P, McLendon K, Preuss CV. Atropine. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Updated 2025 Jul 6

It also underscores the importance of careful perioperative cardiac rhythm monitoring in older adults, particularly those with baseline bradycardia or beta-blocker therapy, because postoperative bradyarrhythmias may unmask clinically significant sinus node dysfunction requiring permanent pacemaker implantation.

Data Availability

All data supporting the conclusions are contained within the article.

Patient Consent

Written informed consent for publication was obtained from the patient.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.