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Gastroduodenal Artery (GDA) Pseudoaneurysm as a Cause of Massive Upper Gastrointestinal (GI) Bleeding Years After Partial Gastrectomy

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Abstract

Gastroduodenal artery (GDA) pseudoaneurysm is a rare complication of gastric and pancreatic surgery. The presentation is often severe gastrointestinal (GI) bleeding with up to a 90% mortality rate. Proper identification of past gastrectomy based on history or endoscopic appearance is essential for timely embolization or surgery, given that endoscopic management often fails. Here, we present a 65-year-old man who has a history of gastric ulcer-related surgery without clear documentation and hypertension presented with hematemesis, black stools, and syncope. Upper endoscopy showed signs of gastroenterostomy with stenosis and duodenal ulcer with spurting hemorrhage. Two days after endoscopic therapy, a recurrence of massive GI bleeding was noted. A celiac arteriogram was done by interventional radiology, demonstrating a pseudoaneurysm off the GDA. Successful embolization was performed with helical coils. The GI bleeding stopped, and the patient became stable after that. The GDA pseudoaneurysm-related bleeding should always be suspected in patients who underwent gastrectomy, bypass surgery, or pancreatectomy. Endoscopic interventions are usually temporary and sometimes can only give anatomical correlation before angiogram and embolization offer a definite treatment. Patients with GDA pseudoaneurysm can be entirely asymptomatic for a long time. The most common site of bleeding is the duodenum. Surgical interventions can also be offered if an angiogram is not successful in stopping the bleeding.

Keywords

gastrointestinal, gastroduodenal artery pseudoaneurysm, visceral artery aneurysms, gastrectomy

Introduction

Visceral artery aneurysms (VAAs), presenting as true aneurysms and pseudoaneurysms, constitute some of the rarest forms of blood vessel anomalies with an approximate incidence of 0.01% to 0.02%.[1] According to Sant'Anna et al,[2] true visceral aneurysms are characterized by the dilation of all 3 arterial layers and often result from hypertension and atherosclerosis. On the contrary, a pseudoaneurysm is defined as the accumulation of blood surrounded by fibrous tissue, mainly stemming from inflammation, iatrogenic trauma, vasculitis, or infection. This abnormality results in blood extravasation through this damage and percolation into the space between the tunica media and adventitia.[3] Visceral pseudoaneurysms are primarily characterized by a periarterial hematoma enveloping the pseudoaneurysm.[4]

The most significant incidence of VAAs has been highlighted in the splenic, hepatic, and superior mesenteric arteries sites, with 60%, 20%, and 5.5% incidence of VAAs found in these sites, respectively.[3] Only about 1.5% of VAAs are

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found in the gastroduodenal site; thus, gastroduodenal VAAs are rare.[3] One of the most documented yet rare gastroduodenal VAAs is the pancreatic artery aneurysm in patients diagnosed with pancreatitis. The etiology of VAAs in the gastroduodenal sites is attributed mainly to vessel weakening and aneurysmal dilation due to autodigestion and erosion of the peripancreatic vessels caused by inflammation.[5] The VAAs are serious disorders associated mainly with life-threatening complications in terms of ruptures and bleeding events.[6] Studies assessing complications associated with visceral artery pseudoaneurysms have associated these disorders with a 90% morbidity and mortality rate in untreated patients and almost 13% in patients receiving treatment.[7]

Conventionally, the first-line treatment for VAAs and pseudoaneurysms is open surgery. Nonetheless, with the inventions and innovations in endovascular therapy over the last few years, hemodynamically stable patients are increasingly treated with coil embolization.[6] Moreover, prompt diagnosis and early intervention are crucial for a better prognosis for VAAs and pseudoaneurysms. In this report, we present a case of an elderly male patient presenting with massive gastrointestinal (GI) bleeding following a hypertensive gastric ulcer-related surgery/partial gastrectomy procedure. On careful assessment and focused examination, this bleeding was attributed to a duodenal ulcer hemorrhage resulting from the blockage of the gastroduodenal artery (GDA) by a pseudoaneurysm. Subsequently, successful embolization using a helical coil stopped the bleeding and stabilized the patient.

Case Presentation

A 65-year-old male, with a history of hypertension and gastric surgery around 25 years prior, presented to the emergency department with hematemesis, black stools, and syncope. Also, endorsed a dull and persistent upper abdominal pain that worsens with vomiting. There was no chest pain or shortness of breath and no fever. No recent non–steroidal anti-inflammatory drugs (NSAIDs) use. On physical examination, the patient was found to be hemodynamically unstable with tachycardia of 120 beats per minute and a blood pressure of 98/66 mm Hg. He appeared pale, sick, and in acute distress but had no active hematemesis. The abdomen was mildly distended but soft and nontender. Otherwise, the physical examination was unremarkable. Laboratory investigations showed low hemoglobin levels (8.5 g/dL from the baseline 13.8 g/dL), platelet count (235 K/uL), creatinine (0.77 mg/dL), and international normalized ratio (INR) at 1.2 (Table 1). Subsequently, the patient was appropriately resuscitated and underwent an upper endoscopy. Endoscopy showed signs of gastroenterostomy stenosis and a duodenal ulcer with spurting hemorrhage, Forest Class Ia. Endoscopic hemostasis required adrenaline injection, bipolar cautery, and clip placement. After that hemostatic spray was applied, and the bleeding was stopped. The patient was subsequently admitted into the intensive care unit, where care continued, and the patient was relatively stable for the next 48 hours after endoscopy. Unfortunately, the patient had a recurrence of GI bleeding, and this time, it was massive, requiring large amounts of transfusion and more aggressive resuscitation. The urgent interventional radiology celiac arteriogram showed a pseudoaneurysm stemming from the GDA with active extravasation. Successful embolization of the GDA aneurysm was done using a helical coil (Figure 1). The angiogram showed no more signs of active bleeding. After that, the patient was monitored for a few days, and no signs of recurrence were noted. The patient was later discharged from the hospital in a stable condition.

Discussion

Despite the rarity of gastroduodenal VAAs, GDA aneurysms located in the duodenum have been associated with a 21% mortality rate, as highlighted by Habib et al.[8] Furthermore, Habib et al8 posit that the incidence of GDA pseudoaneurysm is significantly associated with risk factors including excessive alcohol intake, accounting for 25% incidence, chronic pancreatitis, peptic ulcer disease, and cholecystectomy accounting for 47%, 17%, and 3% incidence of GDA aneurysms, respectively. Some of the rare risk factors include cirrhosis, fibromuscular dysplasia, peripheral artery disease, Marfan syndrome, and Ehlers-Danlos syndrome.[8] Penetrating duodenal ulcer also was suggested as a cause for GDA aneurysm per Chang et al.[9] In the context of this study, the patient did not present with any of the following diseases or alcohol abuse. Thus, the etiology of the GDA aneurysm was suspected to be likely secondary to the previous gastric surgery and stayed asymptomatic for decades.

Several studies have shown GDA pseudoaneurysms presentation in varying timeframes (days, weeks, months, or 1-3 years) following major gastric surgery and other invasive gastric procedures.[10-16] Clinically, unruptured GDA aneurysms are mainly asymptomatic, with a few unlocalized signs, such as abdominal pain, nausea, and vomiting, mainly attributed to compressions in the GI tract.6 This assertion explains the localized abdominal pain in the patient described in this report. Moreover, based on the proximity of the GDA to the bile duct, several incidences of obstructive jaundice owing to compression of the bile duct by the pseudoaneurysm and its associated hematomas have been reported.[17-19] Chen et al[20] documented an interesting case of duodenal necrosis owing to these compressions. Unruptured GDA pseudoaneurysms may also present as midline back soreness and hyperamylasemia.[21,22]

Ruptured GDA pseudoaneurysms in the duodenum, like in this case, exhibit significantly more severe clinical presentations, such as hematemesis and melena, as observed in our patient.[8] Moreover, this rupture is associated with abdominal pain, anemia, and a pulsatile abdominal mass; however, in 7.5% of the cases, this rupture remains asymptomatic.[16,23,24]

Table 1. Laboratory results

Lab test	Lab result	Reference range and units
WBC	9.7	4.0-11.0 K/uL
RBC	**2.75 (L)**	4.40-5.80 M/uL
Hemoglobin	**8.5 (L) (Baseline 13.8)**	13.5-17.5 g/dL
Hematocrit	**26.5 (L)**	40.0-50.0%
MCV	96.4	80.0-98.0 fL
MCH	30.9	25.5-34.0 pg
MCHC	32.1	31.5-36.5 g/dL
RDW-SD	**55.2 (H)**	35.5-50.0 fl
Platelet count	244	140-400 K/uL
Glucose	**190 (H)**	70-99 mg/dL
Sodium	**135 (L)**	136-145 mEq/L
Potassium	3.6	3.5-5.1 mEq/L
Chloride	102	98-109 mEq/L
CO_2	**16 (L)**	20-29 mEq/L
BUN	20	6-22 mg/dL
Creatinine	0.81	0.73-1.18 mg/dL
BUN/creatinine ratio	24.7	10.0-25.0
Calcium	8.5	8.5-10.5 mg/dL
Corrected calcium	9.4	8.5-10.5 mg/dL
Magnesium	2.0	1.6-2.6 mg/dL
Bilirubin total	0.4	0.2-1.2 mg/dL
Alkaline phosphatase	77	40-150 U/L
ALT—SGPT	23	0-55 U/L
AST—SGOT	28	5-34 U/L
Protein total	**5.3 (L)**	6.0-8.3 g/dL
Albumin	**2.9 (L)**	3.2-4.6 g/dL
Prothrombin time (PT)	**15.5 (H)**	12.0-14.5 seconds
INR	**1.2 (H)**	0.9-1.1
Partial thromboplastin time (PTT)	27	24-35 seconds

Several documented cases of GDA aneurysms rupturing in the pancreatic and bile ducts, resulting in hemosuccus pancreaticus and hemobilia, respectively, have been articulated.[25-27]

Standard diagnostic measures for VAAs and pseudoaneurysms involve a computer tomography scan of the upper and lower abdominal areas associated with a 67% sensitivity rate.[23] However, updated diagnostic measures call for computed tomography (CT) angiogram, hailed as the "gold-standard" diagnostic measure associated with 100% sensitivity in diagnosing pseudoaneurysms.[23] Moreover, despite its low sensitivity, about 50%, the abdominal color Doppler ultrasound presents another diagnostic tool helpful in identifying pseudoaneurysm in the GI tract.[16,28] An upper and lower abdominal endoscopy can also be used to exclude other sources of GI bleeding, where the hemorrhage's etiology is unclear.[7,28] Based on the patient's disclosure of a previous surgical procedure, an upper endoscopy visualizing the surgical site was deemed necessary to identify the bleeding site. This intervention revealed the presence of gastroenterostomy stenosis and a duodenal ulcer with spurting hemorrhage (Forrest Class Ia), which is typically associated with arterial bleeding from an ulcer.

Stenosis, described as the narrowing of the gastroenterostomy anastomosis, is a well-documented postgastric surgical complication associated with varying etiologies, including peptic ulcer recurrence, inflammation, infection, surgical technique, and ischemia.[29] The presence of stenosis and a duodenal ulcer in this patient suggests a chronic process of inflammation and mechanical stress that likely contributed to the weakening of the duodenal wall. Endoscopic hemostasis therapy is recommended to use a combination of epinephrine injection with another modality to reduce the risk of rebleeding.[30] The fact that our patient had persistent bleeding right after the adrenaline injection was a clue pointing toward a more complicated cause of bleeding than a simple ulcer.

Even with the use of additional endoscopic techniques like bipolar cautery, clip placement, and hemostatic spray, rebleeding occurred and that also can trigger a decision-making to go directly to other interventions like interventional radiology-based arterial embolization or surgical interventions. Moreover, this development highlighted a crucial limitation of endoscopy in identifying the underlying cause of GI bleeding resulting from vascular anomalies such as aneurysms and pseudoaneurysms.

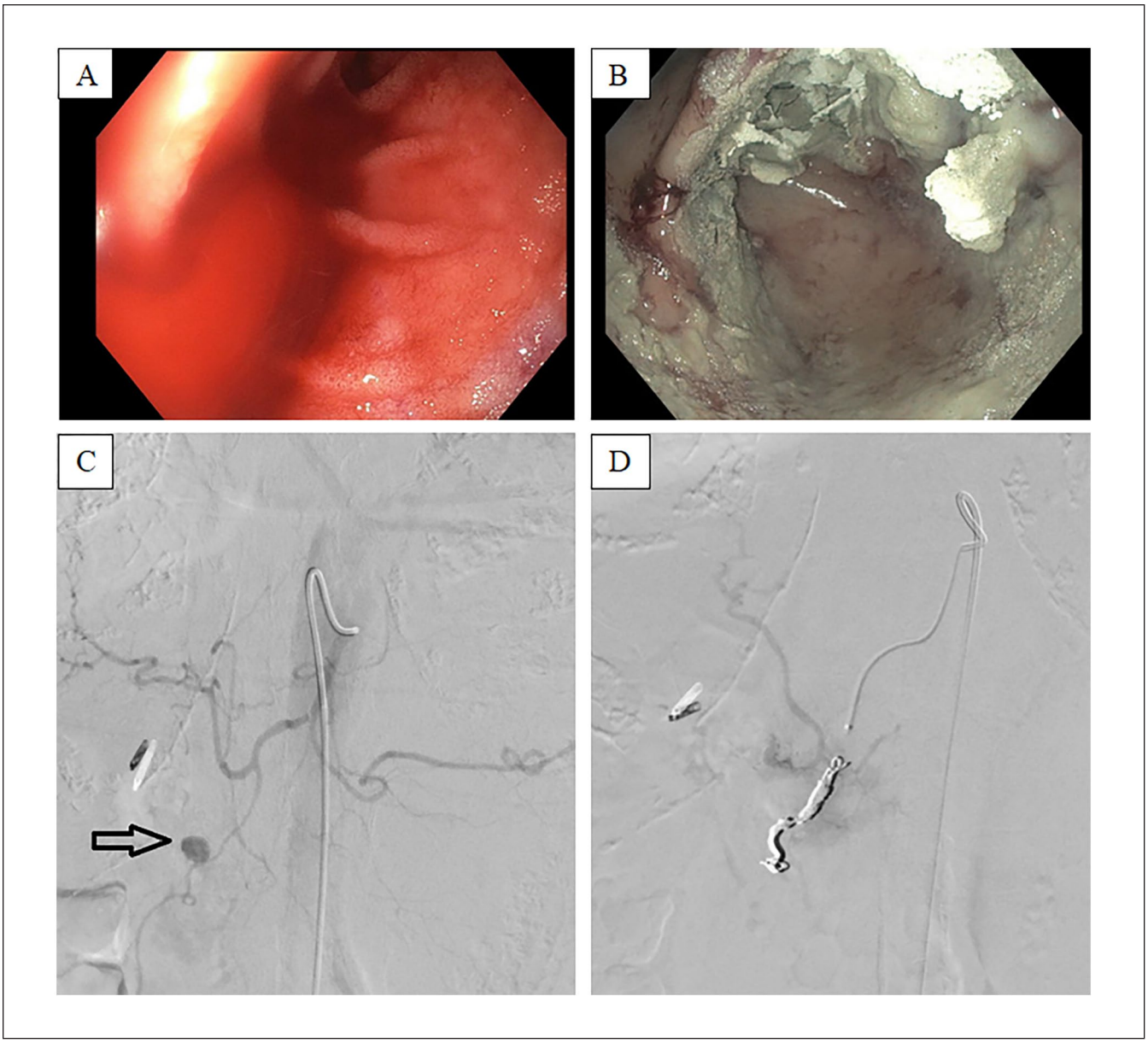

Figure 1. (A) An endoscopic appearance of the bleeding sites (spurting), (B) post-endotherapy, (C): celiac angiogram showing the GDA aneurysm, and (D): angiogram postcoiling.

White et al[31] underscore the need to immediately treat pseudoaneurysms after identification based on the high mortality rates associated with ruptured pseudoaneurysms regardless of their size or the presence/absence of symptoms. While open surgery has been the gold-standard treatment intervention for a long time, more recent therapeutic innovations in endovascular treatment modalities with various embolization techniques, such as coli, stent, and transcatheter thrombin injection, are becoming favorable, especially in stable patients.[7] This increased adoption has been attributed to lower morbidity and mortality rates, decreased postoperative pain, shorter hospital stays, and patients' early return to daily activities compared to conventional surgical interventions.[3,16,24,28] Several studies in this field have advocated for reservation for conventional surgical procedures in hemodynamically unstable patients and patients with failed endovascular embolization attempts.[3,16,24,28] Following a robust transfusion protocol, the patient was deemed relatively hemodynamically stable, prompting endovascular embolization of the gastroduodenal pseudoaneurysm using a helical coil, translating to overall hemodynamic stability and bleeding cessation.

Conclusions

This case underscores the importance of considering a GDA pseudoaneurysm in patients with a history of gastric or pancreatic surgery who present with severe GI bleeding. Endoscopic interventions, while crucial for initial management, may not adequately address vascular causes of bleeding. Angiographic intervention, particularly coil embolization, offers a definitive treatment for GDA pseudoaneurysms and should be considered early in the diagnostic process and possibly to send these patients with suspected GDA pseudoaneurysm directly to interventional radiology after index endoscopy rather than monitoring for rebleeding given the high morbidity and mortality associated with this condition.

Declaration of Conflicting Interests

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Ethics Approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed Consent

Verbal informed consent was obtained from the patient for their anonymized information to be published in this article.

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