International Medical Case Reports Journal

Dovepress
open access to scientific and medical research

Open Access Full Text Article

CASE REPORT

A Rare Case of Gastroduodenal Artery Aneurysm Rupture with Perforated Duodenal Ulcer

Nabeel Yahya Almadwahi[1], Mohamed Ali Alshuja'a[1], Hamza Zaid Al-Hodiafy[2], Haitham Mohammed Jowah[1]

[1]Department of Surgery, Faculty of Medicine, Sana'a University, Sana'a City, Yemen; [2]Department of Vascular Surgery, 48 Model Hospital, Sana'a University, Sana'a City, Yemen

Correspondence: Haitham Mohammed Jowah, Department of Surgery, Faculty of Medicine, Sana'a University, Sana'a City, Yemen, Tel +96774831058, Email h.jowah@su.edu.ye

Purpose: In this case we report a rare presentation of a ruptured gastroduodenal artery aneurysm (GDA) accompanied by a duodenal perforation. It contributes to the scientific literature by discussing the management approach and results in a patient with dual complications and emphasizes the importance of early diagnosis and appropriate treatment.

Case presentation: A 50-year-old male presented with severe abdominal pain, anemia, and signs of hemodynamic instability. Diagnostic imaging including CTA revealed a large, thrombosed gastroduodenal artery aneurysm with evidence of rupture. The patient underwent open surgical exploration and repair to address both the aneurysm and the duodenal perforation. The patient's recovery was satisfactory and was discharged home in stable condition.

Conclusion: Early diagnosis and appropriate management in gastroduodenal artery aneurysms is crucial. There is a need for individualized surgical interventions based on the patient's hemodynamic status and associated complications. Dual complications required open surgical exploration and repair, resulting in favorable outcomes.

Keywords: gastroduodenal artery aneurysm, duodenal perforation, open surgical exploration, outcomes, case report

Introduction

Gastroduodenal artery aneurysm (GDAA) is a rare but life-threatening condition that accounts for approximately 1.5% of all visceral artery aneurysms.[1] The causes of GDAA formation are diverse, including atherosclerosis, trauma, infection, and congenital anomalies.[2] Complications may arise from the aneurysm itself or its association with other gastrointestinal pathologies, such as peptic ulcer disease (PUD). In this report, we present the rare case of ruptured gastroduodenal artery aneurysm following a perforated duodenal ulcer. This combination of complications has rarely been documented in the medical literature and highlights the potential risk factors that contribute to such events.

Case Presentation

A 50-year-old male patient with a known medical history of diabetes mellitus (DM) and hypertension (HTN), managed irregularly, presented to our hospital in Sana'a City, Yemen, on 25 May 2022, at 5:30 pm. The patient was referred to another hospital and reported severe abdominal pain that lasted for one week before admission. The pain was localized in the epigastric region, of sudden onset, progressively worsening, and radiating to the back. In addition, the patient experienced generalized abdominal distension, nausea, vomiting, and significant fatigue. A history of melena and food-related vomiting was also reported over the past month. Two days before admission, the patient had received a blood transfusion of 2 units. There was no history of previous surgeries or a family history of malignancy.

Upon examination, the patient was conscious and alert but exhibited severe pallor. Blood pressure was recorded as 90/60 mmHg and the pulse rate was 120 beats per minute. Generalized abdominal distension, particularly prominent in the supraumbilical region with downward displacement of the umbilicus, was observed. Mild tenderness was present in the

Received: 13 March 2024
Accepted: 14 June 2024
Published: 17 June 2024

epigastric area, along with positive bowel sounds, digital rectal examination revealed a normal anal sphincter tone and no palpable mass.

Hematological and biochemical investigations revealed hypochromic microcytic anemia with a hemoglobin level of 6 g/dL (normal range: 12–15.5 g/dL), a white blood cell count of 16,000 (normal range: 4–10,000), and a platelet count of 303. The blood urea nitrogen level was 7 mg/dL (normal range: 10–20 mg/dL), creatinine was 0.49 mg/dL (normal range: 0.7–1.5% / dL), the international normalized ratio was 1.34 (normal range: 0.62–1.3), the prothrombin time (PT) was 16.9, the partial thromboplastin time (PTT) was 30, calcium was 8.0 mg/dL (normal range: 8.5–10.1 mg / dL) and lactic acid was 1.9 mmol/L (normal range: 0.5–2.2% / L). Liver enzymes and amylase levels were within normal limits.

Diagnostic imaging studies were conducted, including erect chest radiograph and abdominal ultrasound. The chest radiograph did not reveal any subdiaphragmatic air, but an elevation was observed in the left diaphragm. Abdominal ultrasound demonstrated the presence of an intra-abdominal fluid collection. Subsequently, an abdominal CT angiography (Figure 1) was performed, which revealed a hematoma measuring approximately 14.3×8.8 cm in the paraumbilical region. Within the hematoma, a 3.4×2.2 cm arterial aneurysm was identified connected to the gastroduodenal artery, accompanied by surrounding edematous changes. These findings were suggestive of a large, thrombosed aneurysm in the gastroduodenal artery. Furthermore, eventration of the left diaphragm, which contains the spleen and part of the stomach, was observed, along with mild to moderate intraperitoneal fluid collection. No evidence of an aortic aneurysm was detected.

To stabilize the patient, resuscitation was initiated with 1000 ml of Ringer lactate and three units of fresh blood were transfused. Informed consent for the high-risk intervention was obtained and the patient was immediately taken to the operating room. Under general anesthesia, in the supine position and with strict adhesion to aseptic techniques, a midline laparotomy incision was made. When the peritoneum was opened, approximately 2000 ml of blood was evacuated, revealing an occluded, pulsating mass in the duodenum. Adequate exposure was achieved using a self-reinforcement retractor. The flexure of the liver and the transverse colon were mobilized inferiorly from the head of the pancreas and clotted blood was removed from the lesser momentum (Figure 2). Meticulous dissection was performed over the large pulsatile occluded aneurysm in the gastroduodenal artery by opening the gastrohepatic ligament. Mobilization of the pylorus and duodenum away from the head of the pancreas exposed a fistula that connected the duodenum and the aneurysm, without digestive content (Figure 3). Following heparinization, proximal and distal clamping of the gastroduodenal artery was performed. Subsequently, the pseudoaneurysm was opened and a significant amount of thrombus was evacuated. Aneurysmorrhaphy was performed using proline 7.0 sutures. The perforation in the first part of the duodenum was repaired in two layers and a nasogastric tube (NGT) was inserted beyond the perforation. Thorough irrigation with normal saline and meticulous hemostasis were achieved. An abdominal drain was placed, and the abdominal incision was closed in layers. The patient was then transferred to the intensive care unit (ICU) for close monitoring and observation.

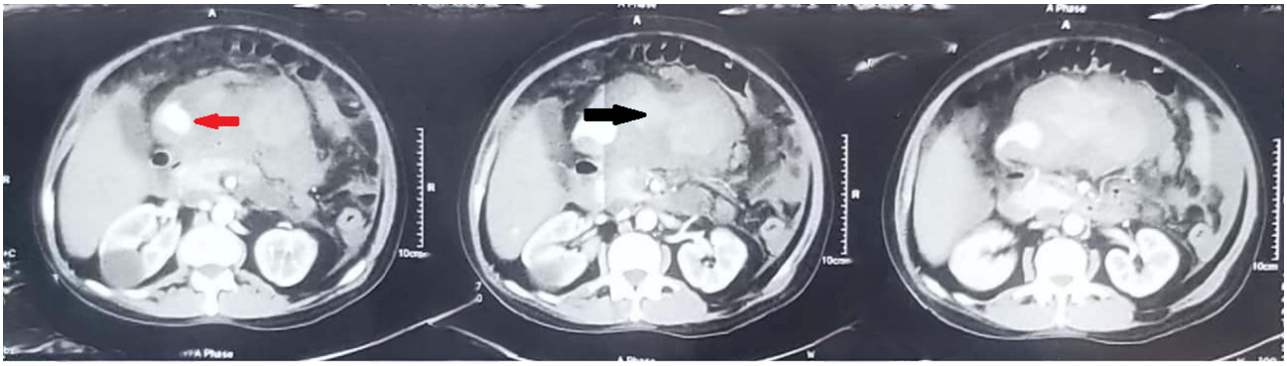

Figure 1 CT angiography of the abdomen and pelvis (axial view) showing a 14.3×8.8 cm hematoma observed in the paraumbilical region (black arrow) containing a 3.4×2.2 cm arterial aneurysm connected to the gastroduodenal artery (red arrow), with surrounding edematous changes. These findings are suggestive of a large, thrombosed GDA aneurysm.

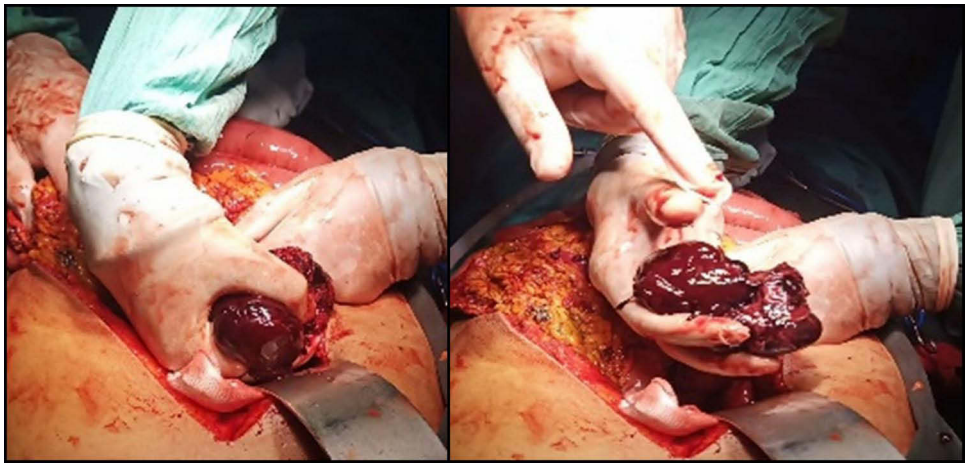

Figure 2 Intraoperative view showing the evacuation of a large intra-abdominal hematoma collection located between the duodenum and the gastroduodenal artery aneurysm.

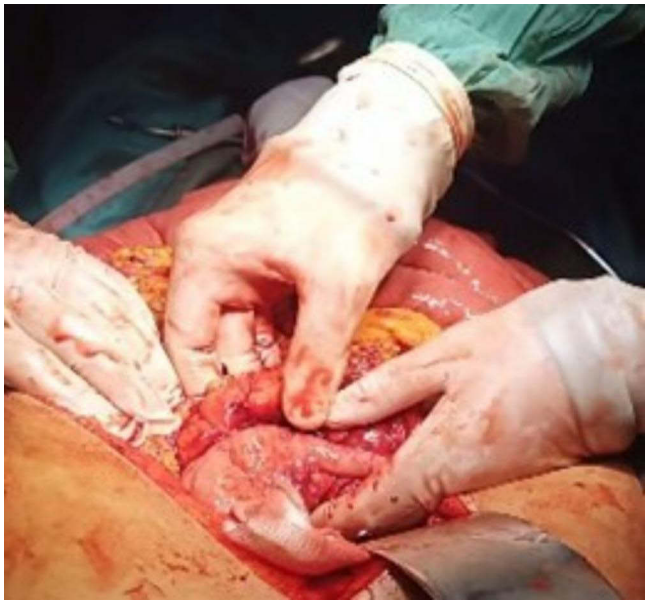

Figure 3 Intraoperative view showing mobilization of the pylorus and duodenum away from the head of the pancreas, exposing a fistula that connected the duodenum and the aneurysm.

During the postoperative period, the abdominal drain collected approximately 100 ml of serous fluid, which was removed the third day after the operation. The patient's recovery progressed without complications (Figure 4). After ten days after surgery, the patient was discharged home in favorable condition. Follow-up appointments were scheduled in the outpatient department and regular communication was maintained by telephone, with the patient's condition reported as satisfactory.

Discussion

The management of ruptured gastroduodenal artery aneurysms (GDAs) with perforated peptic ulcer disease (PUD) presents a complex clinical challenge. While the existing literature provides some guidance, it is limited by the rarity of these cases and the lack of large, prospective studies. As a result, the optimal management strategy remains unclear and must be individualized based on patient factors and institutional resources.

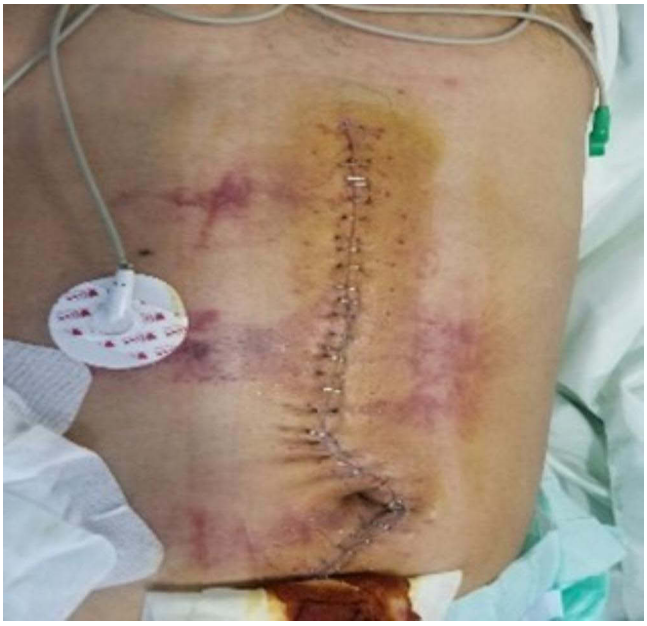

Figure 4 Postoperative photo shows no complications at the site of incision.

Gastroduodenal artery aneurysms (GDAs) are rare but potentially life-threatening vascular anomalies, accounting for approximately 1.5% of all visceral artery aneurysms.[1,2] They can be classified as true aneurysms or pseudoaneurysms, with the latter being most commonly associated with pancreatitis.[3,4] However, the etiology of GDAs remains poorly understood. Several potential risk factors have been proposed, including trauma, hypertension, and atherosclerosis.[5] In our case, the presence of hypertension and atherosclerosis may have contributed to the development of the GDA. Additionally, the GDA pseudoaneurysm may have arisen as a complication of perforated peptic ulcer disease.

GDAs can present with a range of symptoms. Some patients may experience recurrent vomiting postprandially due to an aneurysm piercing the pyloric channel.[6] GDAs can also cause gastrointestinal bleeding, manifesting as fatigue, nausea, anorexia, abdominal pain, and melena.[7] In some cases, GDAs may remain asymptomatic but can lead to abdominal pain, anemia, and potential multi-organ failure.[8] Our patient's presentation was consistent with these reports.[6–8]

The diagnosis of GDAs is often challenging due to their nonspecific symptoms. However, computed tomography angiography (CTA) has emerged as a crucial diagnostic tool. CTA is frequently the investigation of choice due to its high sensitivity and specificity.[9] It not only detects the presence of the aneurysm but also provides essential information about its size, location, and relationship to surrounding structures, which is vital for planning surgical or endovascular intervention.[10] In some cases, GDAs may be incidentally discovered on CT scans performed for other indications.[11] While ultrasound may also be used in the diagnosis of GDAs, its sensitivity is lower than that of CTA.[12] Abdominal magnetic resonance angiography (MRA) is also effective in diagnosing GDAs, but CTA remains the gold standard.[13] The diagnostic approach depends on the clinical scenario, and CTA is a useful adjunct to diagnose, evaluate, and manage GDAs.[14] In our case, CTA was instrumental in confirming the diagnosis and guiding surgical intervention. However, in hemodynamically unstable patients, surgical exploration may be necessary without prior CTA.

GDAs can have devastating complications, including rupture, upper gastrointestinal bleeding, and minor bleeding episodes.[6,13,15] Rupture of a GDA is a potentially catastrophic event with an incidence of approximately 0.01% to 0.2% and carries a high risk of mortality.[11,16] These aneurysms often present with spontaneous rupture and are associated with a high mortality rate[11] GDAs can also cause upper gastrointestinal bleeding, which may occur several days after the initial injury. Some patients may experience minor bleeding episodes before suffering a major hemorrhage. Prompt diagnosis of GDAs before rupture is critical, as early detection can help prevent severe complications. In our patient, rupture of the GDA was confirmed by radiological and intraoperative findings, evidenced by moderate to severe hemoperitoneum. However, the formation of a pseudoaneurysm with subsequent thrombosis and hematoma formation

between the aneurysm and the duodenum likely contributed to the patient's gradual presentation over one week. This pseudoaneurysm formation may have acted as a temporary tamponade, preventing potentially fatal exsanguination.

The role of endovascular versus open surgical intervention in the management of ruptured GDAs is debated. Endovascular embolization is generally preferred due to its minimally invasive nature and potential for less morbidity.[17] However, in patients presenting in hemorrhagic shock, as in our case, immediate surgical exploration may be lifesaving.[11,18] Open surgery allows for simultaneous repair of the aneurysm and treatment of the perforated PUD.[4] In institutions with limited endovascular expertise, open surgery may be the most practical option to ensure immediate intervention.[19,20]

While our case illustrates one successful approach to managing this complex clinical entity, further research is needed to determine the optimal management strategy. A multidisciplinary approach, involving both surgeons and interventional radiologists, is likely beneficial in these cases. As endovascular techniques continue to evolve, their role in the management of ruptured GDAs will require ongoing reevaluation. Despite the challenges in studying these rare cases, further research is necessary to improve outcomes for patients with ruptured GDAs and perforated PUD.

Conclusion

In conclusion, ruptured gastroduodenal artery aneurysms with perforated peptic ulcer disease represent a complex and challenging clinical entity. Prompt diagnosis, often facilitated by computed tomography angiography, is critical in preventing catastrophic complications. While minimally invasive endovascular techniques are generally preferred, open surgical intervention may be necessary in hemodynamically unstable patients or those with limited access to endovascular expertise. Our case underscores the importance of a multidisciplinary approach, involving both surgeons and interventional radiologists, in managing these complex vascular emergencies.

Abbreviations

GDAA, gastroduodenal artery aneurysm; PUD, peptic ulcer disease; NGT, nasogastric tube; ICU, intensive care unit; CTA, Computed tomography angiography.

Data Sharing Statement

The data sets used and/or analyzed during the current study are available from the corresponding author on a reasonable request.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the Yemeni Council of Health Specialization. The patient also consented to the publication.

Consent for Publication

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Acknowledgments

The authors thank the Yemeni Consultant Hospital Administration and the patient for permitting the publication of this case report. This paper has been uploaded to Research Square as a preprint: https://doi.org/10.21203/rs.3.rs-3954681/v1.

Funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Sessa C, Tinelli G, Porcu P, Aubert A, Thony F, Magne JL. Treatment of Visceral Artery Aneurysms: description of a Retrospective Series of 42 Aneurysms in 34 Patients. *Ann Vasc Surg*. 2004;18(6):695–703. doi:10.1007/s10016-004-0112-8
2. Stanley JC. Splanchnic Artery Aneurysms. *Arch Surg*. 1970;101(6):689. doi:10.1001/archsurg.1970.01340300045009
3. Santos-Rancaño R, Antona EM, Montero JVM. A Challenging Case of a Large Gastroduodenal Artery Pseudoaneurysm after Surgery of a Peptic Ulcer. *Case Rep Surg*. 2015;2015:1–3. doi:10.1155/2015/370937
4. Kar H, Cakır V, Tanyeli HF, Celik SC, Akgul O. Spontaneous True Gastroduodenal Artery Aneurysm Rupture after an Inguinal Hernia Operation. *Chirurgia*. 2018;113(2):261. doi:10.21614/chirurgia.113.2.261
5. Coll DP, Ierardi R, Kerstein MD, Yost S, Wilson A, Matsumoto T. Aneurysms of the Pancreaticoduodenal Arteries: a Change in Management. *Ann Vasc Surg*. 1998;12(3):286–291. doi:10.1007/s100169900155
6. Giri S, Angadi S, Bhrugumalla S. Gastroduodenal artery aneurysm presenting as gastric outlet obstruction. *Digestive Liver Dis*. 2022;54 (11):1588–1589. doi:10.1016/j.dld.2022.05.010
7. Kagihara JE, Canakis JP, Cruz FC, Borum ML, Schueler SA. S2599 Gastroduodenal Artery Aneurysm: when Endoscopy Is Not the Answer. *Am J Gastroenterol*. 2022;117(10S):e1723–e1724. doi:10.14309/01.ajg.0000867036.21906.ab
8. Al Baghdadi M, Yedla P. Visceral artery aneurysm: an unusual cause of abdominal pain. *BMJ Case Rep*. 2020;13(12):e238019. doi:10.1136/bcr-2020-238019
9. Zarin M, Ali S, Majid A, Jan Z. Gastroduodenal artery aneurysm – post traumatic pancreatic pseudocyst drainage – an interesting case. *Int J Surg Case Rep*. 2018;42:82–84. doi:10.1016/j.ijscr.2017.11.049
10. Horton KM, Smith C, Fishman EK. MDCT and 3D CT Angiography of Splanchnic Artery Aneurysms. *Am J Roentgenol*. 2007;189(3):641–647. doi:10.2214/AJR.07.2210
11. Habib N, Hassan S, Abdou R, et al. Gastroduodenal artery aneurysm, diagnosis, clinical presentation and management: a concise review. *Ann Surg Innov Res*. 2013;7(1):4. doi:10.1186/1750-1164-7-4
12. Oliner C, Pinkhasov M, Aytaman A. Gastroduodenal Artery Aneurysm: a Gastrointestinal Challenge: 800. *Official j Am Coll Gastroenterol*. 2012;107.
13. Babu A, Rattan A, Singhal M, Gupta A, Kumar S. Gastroduodenal artery aneurysm – a rare complication of traumatic pancreatic injury. *Chin J Traumatol*. 2016;19(6):368–370. doi:10.1016/j.cjtee.2016.02.003
14. Díaz-Zamudio M, Bacilio-Pérez U, Herrera-Zarza MC, et al. Coronary Artery Aneurysms and Ectasia: role of Coronary CT Angiography. *RadioGraphics*. 2009;29(7):1939–1954. doi:10.1148/rg.297095048
15. Shawky MS, Tan J, French R. Gastroduodenal Artery Aneurysm: a Case Report and Concise Review of Literature. *Ann Vasc Dis*. 2015;8 (4):331–333. doi:10.3400/avd.cr.15-00086
16. Yen YT, Lai HW, Lin CH. Endovascular Salvage for Contained Rupture of Gastroduodenal Artery Aneurysm Presented with Obstructive Jaundice. *Ann Vasc Surg*. 2015;29(5):1017.e1–1017.e5. doi:10.1016/j.avsg.2014.12.040
17. Casas ALF, Camargo MP, Moisés CB, Trad HS, Joviliano EE. Aneurisma de artéria gastroduodenal submetido a tratamento endovascular: relato de caso. *J Vasc Bras*. 2019;18. doi:10.1590/1677-5449.190019
18. Matsuno Y, Mori Y, Umeda Y, Imaizumi M, Takiya H. Surgical Repair of True Gastroduodenal Artery Aneurysm: a Case Report. *Vasc Endovascular Surg*. 2008;42(5):497–499. doi:10.1177/1538574408316916
19. Belmir H, Tijani Y, El Kettani C, El Ghanmi A, Chtata H, Taberkant M. Anévrisme rompu de l'artère gastroduodénale révélé par des hématémèses: à propos d'un cas. *Pan Afr Med J*. 2020;37. doi:10.11604/pamj.2020.37.244.22380
20. Almadwahi N, Alkadri A, Ahmed F, Al-wageeh S, Algazali A, Badheeb M. Surgical repair of ruptured gastroduodenal artery aneurysm caused by duodenal ulcer: a case report. *J Em Med Trauma Acute Care*. 2023;2023(2):15. doi:10.5339/jemtac.2023.14