



Acute pancreatitis after total aortic arch replacement leading to walled-off necrosis: A case report and review of literature

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Specialty type: Medicine, research and experimental

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's classification

Scientific Quality: Grade B, Grade B

Novelty: Grade B, Grade B

Creativity or Innovation: Grade B, Grade B

Scientific Significance: Grade B, Grade B

P-Reviewer: Huang JQ

Received: December 16, 2024

Revised: March 5, 2025

Accepted: April 15, 2025

Published online: August 6, 2025

Processing time: 134 Days and 13.2 Hours



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Abstract

BACKGROUND

Although acute pancreatitis and walled-off necrosis (WON) are rare complications following aortic surgery, they are serious risk factors for postoperative mortality. Considering the poor general condition of the postoperative patient, more effective and less invasive treatments are favorable.

CASE SUMMARY

A 67-year-old man was referred to our hospital for the treatment of WON after acute pancreatitis. He had undergone total aortic arch replacement due to aortic arch aneurysm and coronary artery bypass grafting due to angina pectoris 6 weeks prior in another hospital. On the second postoperative day, laboratory data and computed tomography showed that the patient had developed acute pancreatitis. Although conservative management (antibiotics, hydration, etc.) had helped in relieving the symptoms of acute pancreatitis, peripancreatic fluid collection (PFC) persisted, accompanied by duodenal obstruction and vomiting. Contrast-enhanced computed tomography showed that the heterogeneous enhancement and fluid collection in the pancreatic body and tail had increased, consistent with walled-off WON. We therefore performed endoscopic ultrasound-guided transluminal drainage for the PFC. As a result, the WON resolved gradually, resulting in improved oral intake.

CONCLUSION

Acute pancreatitis is a rare gastrointestinal complication following thoracic and

thoracoabdominal aortic aneurysm surgery. To the best of our knowledge, this is the first case of WON after aortic arch surgery treated with endoscopic ultrasound-guided transluminal drainage for PFC.

Key Words: Aortic arch replacement; Endoscopic ultrasound-guided drainage; Peripancreatic fluid collection; Walled-off necrosis; Case report

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Core Tip: We experienced a 67-year-old man who suffered from walled-off necrosis (WON) after total aortic arch replacement due to aortic arch aneurysm 6 weeks before. After conservative management (antibiotics, hydration, *etc.*), the WON did not improve but also caused duodenal obstruction and vomiting. We performed endoscopic ultrasound-guided transluminal drainage for the peripancreatic fluid collection. As a result, the WON resolved gradually resulting in improved oral intake. Acute pancreatitis is a rare gastrointestinal complication following thoracic and thoracoabdominal aortic aneurysm surgery. To the best of our knowledge, this is the first case of WON after aortic arch surgery treated with endoscopic ultrasound-guided transluminal drainage.

Citation: Inoue Y, Yata Y, Yokota Y, Li ZL, Kawabata K. Acute pancreatitis after total aortic arch replacement leading to walled-off necrosis: A case report and review of literature. *World J Clin Cases* 2025; 13(22): 104165

URL: <https://www.wjgnet.com/2307-8960/full/v13/i22/104165.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v13.i22.104165>

INTRODUCTION

Although acute pancreatitis and walled-off necrosis (WON) are rare complications following aortic surgery, occurring in 0.3%-1.8% of the cases[1-3], they are serious risk factors for postoperative mortality. Considering the poor general condition of the postoperative patient, more effective and less invasive treatments are favorable. We report the first case of WON secondary to total arch replacement successfully treated with endoscopic ultrasound (EUS)-guided drainage.

CASE PRESENTATION

Chief complaints

A 67-year-old man (height: 159 cm, weight: 57 kg, Asian, unemployed) was referred to our hospital because of vomiting.

History of present illness

He had undergone total aortic arch replacement due to aortic arch aneurysm and coronary artery bypass grafting due to angina pectoris in the previous hospital. On the second postoperative day, he developed acute pancreatitis. Even after the treatment for pancreatitis, peripancreatic fluid persisted and induced duodenal obstruction and vomiting. He was referred to our hospital for further treatment.

History of past illness

His past medical history included type 2 diabetes mellitus, acute myocardial infarction, abdominal aortic replacement due to aneurysm rupture, and endovascular aortic repair due to iliac artery aneurysm 7 years prior.

Personal and family history

He denied any family history of pancreatitis or aneurysms.

Physical examination

On physical examination, the vital signs were as follows: Body temperature: 37.2 °C; blood pressure: 133/85 mmHg; heart rate: 108 beats per minute; SpO₂: 98%. The clinical abdominal examination revealed tenderness in the upper abdomen and no rebound tenderness.

Laboratory examinations

On the second postoperative day, laboratory data as an evaluation for postoperative complications showed increased serum amylase (2113 U/L) and C-reactive protein (CRP, 15.1 mg/dL) levels and an elevated white cell count [white blood cell (WBC), 22100/μL]. Conservative management (hydration and a protease inhibitor as a treatment of acute pancreatitis and antibiotics as a treatment for possible postoperative infection) relieved acute pancreatitis (serum amylase: 47 U/L; CRP: 2.4 mg/dL; WBC: 6900/μL). However, the peripancreatic fluid collection had not improved. Therefore, he was

referred to our hospital for the treatment of WON. On the day of the transfer, blood analysis revealed mild anemia (hemoglobin: 12.0 g/dL) and normal WBC and platelet counts. Serum CRP and creatinine levels were increased (2.69 mg/dL and 1.54 mg/dL, respectively), while other blood biochemistry findings were normal.

Imaging examinations

On the second postoperative day, computed tomography (CT) showed an enlarged pancreas and increased density of the peripancreatic fat. Conservative management relieved the acute pancreatitis, based on the laboratory investigation. However, the peripancreatic fluid collection had not improved even on postoperative day 30 and was inducing duodenal obstruction and vomiting. Contrast-enhanced CT showed that the heterogeneous enhancement and fluid collection (maximum diameter 18.5 cm) in the pancreatic body and tail had increased compared with the observations made 6 weeks prior. This was consistent with WON (Figure 1). The WON was compressing the horizontal part of the duodenum (Figure 2). He was referred to our hospital for the treatment of WON. Magnetic resonance cholangiopancreatography revealed that the main pancreatic duct was patent and was not connected to the WON. Upper gastrointestinal endoscopy revealed no mucosal abnormality.

FINAL DIAGNOSIS

He was finally diagnosed with a symptomatic WON secondary to acute pancreatitis following cardiovascular surgery.

TREATMENT

Even after 6 weeks of conservative management (antibiotics: Intravenous vancomycin hydrochloride 0.5 g every 12 hours and meropenem hydrochloride 0.5 g every 8 hours followed by oral levofloxacin hydrate 600 mg once a day), the WON had not resolved. Moreover, it continued to cause vomiting and impair oral intake. We performed EUS-guided transluminal drainage for WON on day 8 after he was transferred (Figure 3). The WON was punctured through the posterior wall of the upper gastric body with a 19-gauge needle (EZ Shot3 Plus®; Olympus medical Systems, Tokyo, Japan) under EUS (EU-ME2 GF-UCT260; Olympus medical Systems, Tokyo, Japan) guidance. The contents of the WON were then suctioned through the needle. The fluid was brownish and cloudy. The bacterial culture was negative. Thereafter, a guidewire (0.025 inches VisiGlide2®; Olympus Medical Systems, Tokyo, Japan) was inserted through the needle. We dilated the puncture site by balloon dilatation (REN®; KANEKA, Tokyo, Japan) with 8 atm (810 kPa) of pressure (to achieve 8 mm in diameter). A catheter with a double lumen biliary cytology brush (CytoMaxII™; COOK MEDICAL, Tokyo, Japan), without the cytology brush was inserted over the guidewire. An additional wire (Hydra Jag™; Boston Scientific Japan, Tokyo, Japan), a 7-Fr 4-cm double pigtail plastic stent (Zimmon®; COOK MEDICAL, Tokyo, Japan), and a 6-Fr pigtail nasal drainage tube (Flexima™; Boston Scientific Japan, Tokyo, Japan) were also placed at the puncture site to provide continuous drainage for the contents of the WON. No complications were encountered during the procedure.

On day 4 of drainage, the patient started a liquid diet without vomiting. The WON gradually shrank to 16 cm in diameter on the day 3 after drainage (Figure 4), and we removed the nasal drainage stent. Thereafter, CRP levels started decreasing, and his oral intake increased. However, the CRP level increased again (29 mg/dL), and contrast-enhanced CT showed that the WON now measured 18 cm in diameter (Figure 4). Therefore, we performed EUS-guided transluminal drainage for the second time and inserted two additional stents (Zimmon®; COOK MEDICAL, Tokyo, Japan) on postoperative day 77 (day 27 after the first drainage). Following additional antibiotics (tazobactam/piperacillin 4.5 g every 8 hours) and additional stents, CRP improved (5.39 mg/dL). He later complained of upper abdominal pain and had fever on day 36 after the additional stents were inserted. CT showed that the caudal wall of the WON had become attached to the horizontal part of the duodenum. Upper gastrointestinal tract series showed a fistula between the WON and duodenum, which was confirmed endoscopically (Figure 5). Despite the fistula, abdominal pain resolved and the CRP level improved to 4.3 mg/dL, with conservative therapy (tazobactam/piperacillin 4.5 g every 8 hours). Eventually, on postoperative day 165 (115 days after the first drainage, 78 days after the second drainage) the WON had almost disappeared (Figure 4).

OUTCOME AND FOLLOW-UP

Even after continued oral intake, the laboratory examination showed a decreased serum albumin level (2.0 g/dL), indicating a poor nutritional status. He suffered from aspiration pneumonia 2 months after the first drainage. After the treatment of the pneumonia, he was transferred to another hospital for further rehabilitation. Three months after transfer, he died after a recurrence of the pneumonia. The treatment of WON did not induce the recurrence of the pneumonia.

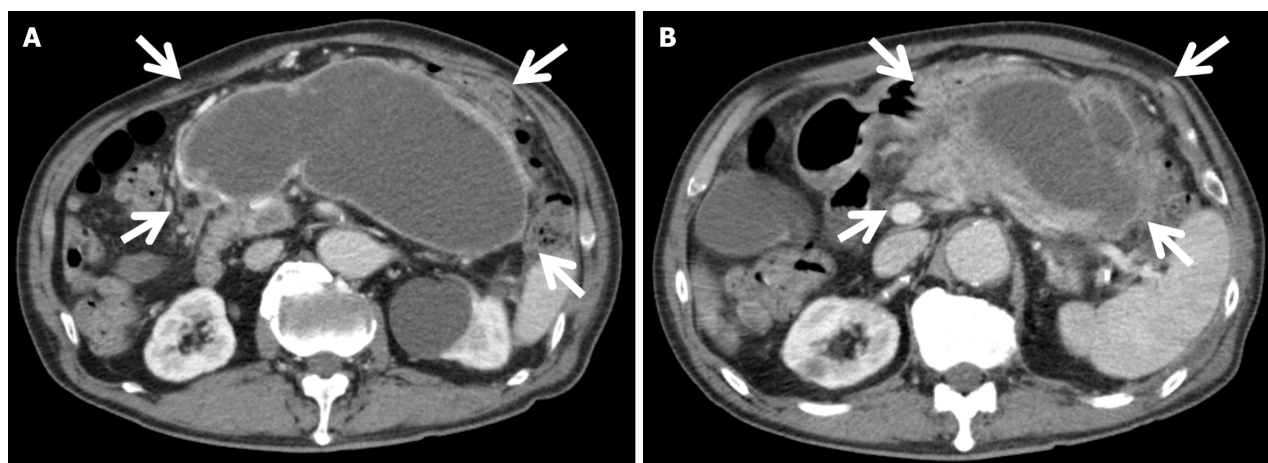


Figure 1 Contrast-enhanced computed tomography on postoperative day 42. The heterogeneous enhancement and fluid collection (surrounded by white arrows) in the pancreatic body and tail, which were consistent with walled-off necrosis (WON). A: Caudal slice of the WON; B: Cranial slice of the WON.

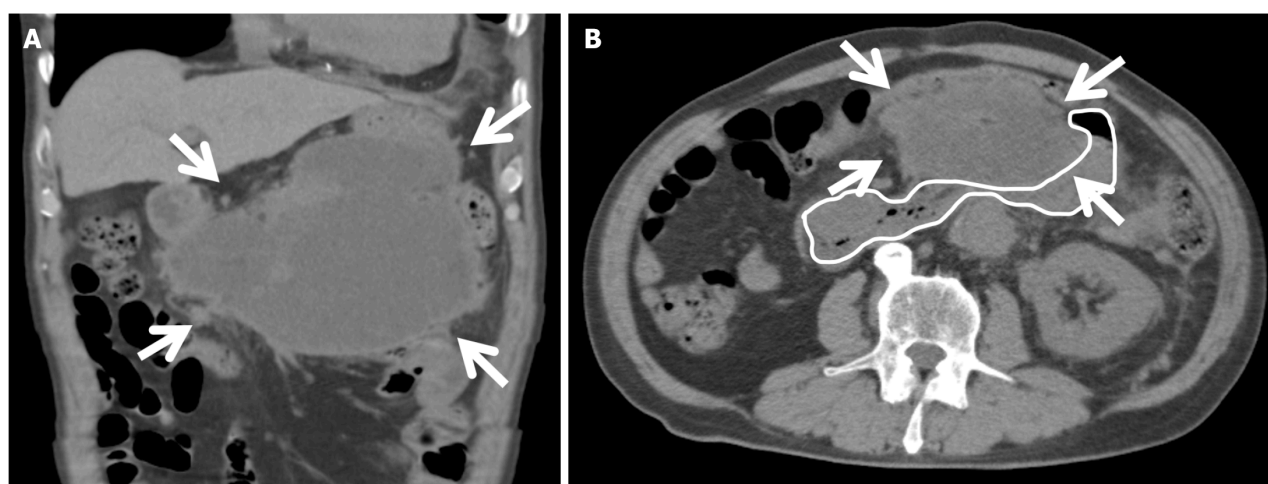


Figure 2 Computed tomography on postoperative day 42. These computed tomography showed that the walled-off necrosis (arrows) was compressing the horizontal part of the duodenum (outlined in the white line). A: Coronal; B: Axial.

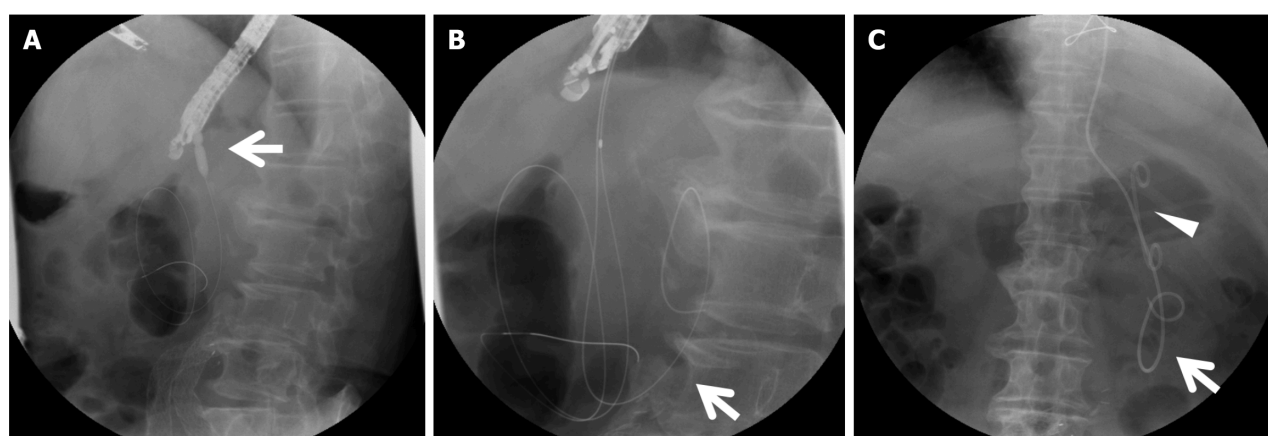


Figure 3 Endoscopic drainage of walled-off necrosis on postoperative day 50. A: Dilation of the puncture site of a gastric wall using a dilation balloon (arrow); B: Additional wire (arrow) insertion; C: Double pig tail plastic stent (arrowhead) and pigtail nasal drainage tube (arrow) placement.

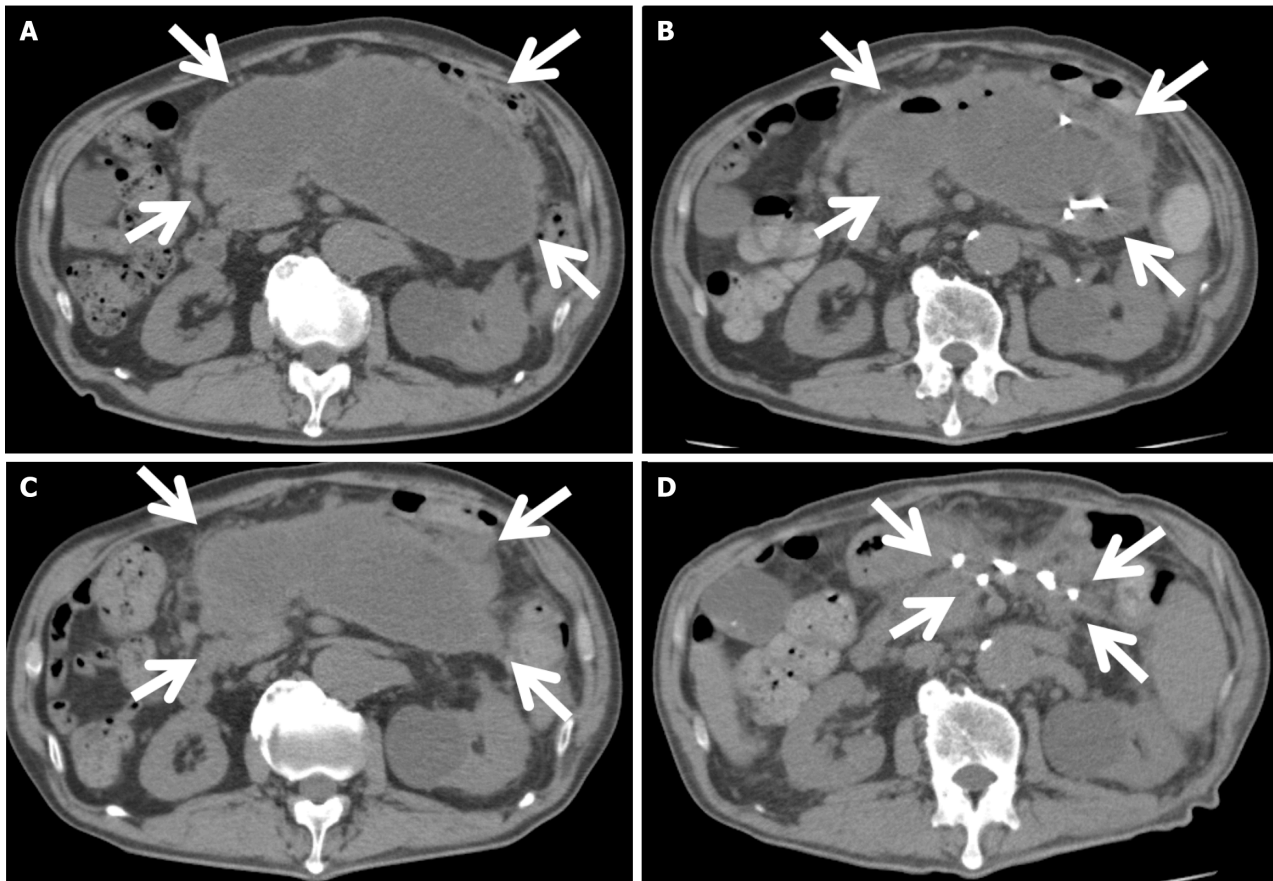


Figure 4 Abdominal computed tomography showing gradual shrinkage of walled-off necrosis. A: On postoperative day 42 (before the drainage) the diameter of walled-off necrosis (WON) (surrounded by arrows) was 18.5 cm; B: On postoperative day 53 (3 days after the first drainage) the diameter of WON (surrounded by arrows) was 16 cm; C: On postoperative day 63 (13 days after the first drainage, before the second drainage) the diameter of WON (surrounded by arrows) was 18 cm; D: On postoperative day 165 (115 days after the first drainage, 78 days after the second drainage) WON (surrounded by arrows) almost disappeared.

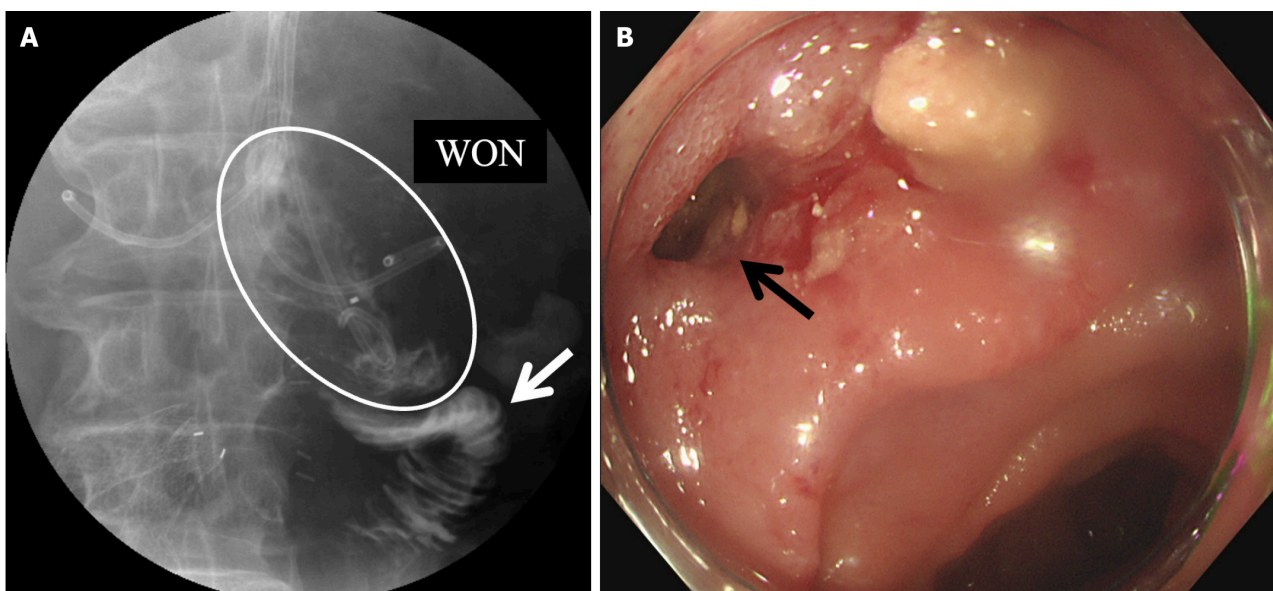


Figure 5 Image examination proved the fistula between walled-off necrosis and the duodenum. A: The upper gastrointestinal tract contrast study showing a fistula between the walled-off necrosis (white circle) and duodenum (white arrow); B: Endoscopy showing the position of the fistula (black arrow). WON: Walled-off necrosis.

Table 1 Walled-off necrosis after pancreatitis complicated with cardiovascular disease

Case age/sex	Cardiovascular disease/therapy	Location	Pancreatic disease	Therapy	Outcome	References
1 (69/male)	Aneurysm/TEVAR (distal edge was directly above SMA)	Descending aorta	Acute pancreatitis/WON	Conservative (hydration, etc.)	Improvement	Kawatani <i>et al</i> 2017[18]
2 (81/male)	Aneurysm/stenting	Abdominal aorta	Disconnected pancreatic duct syndrome	EUS drainage	Improvement	Yamada <i>et al</i> 2019[19]
3 (72/male)	Aortic valve stenosis/aortic valve replacement	Aortic valve	Ischemic acute pancreatitis/WON	EUS drainage	Improvement	Masuda <i>et al</i> 2020[20]
4 (67/male)	Aneurysm/total aortic arch replacement	Aortic arch	Acute pancreatitis/WON	EUS drainage	Improvement	Our case

TEVAR: Thoracic endovascular aortic repair, SMA: Superior mesentery artery, WON: Walled-off necrosis, EUS: Endoscopic ultrasound.

DISCUSSION

Some cases of acute pancreatitis associated with aortic diseases, such as ruptured abdominal aortic aneurysm[4], aortic dissection[5,6], and mycotic aortic aneurysm[7], and those occurring after elective surgical repair for abdominal aortic aneurysm[2] have been reported. In these cases, the lesions were located in the abdominal aorta, which directly supplies blood to the pancreas *via* hepatic, superior mesenteric, and splenic arteries. In our case, the patient developed acute pancreatitis after aortic arch aneurysm repair. Acute pancreatitis following an aortic surgery is an orphan complication (0.3%-1.8%)[1-3], but it is associated with a high mortality rate (20%-40%)[1,2]. Pathologically, ischemia[8], thrombosis, inflammation, or direct injury are considered to cause pancreatitis associated with aortic aneurysm. Ischemia is considered an especially important risk factor for acute pancreatitis, which is known as ischemic pancreatitis[9]. Taking into account the absence of gallstones, hypertriglyceridemia (triglycerides: 129 mg/dL), hypercalcemia (serum calcium level: 8.1 mg/dL, calcium level corrected for albumin: 8.7 mg/dL), and alcohol consumption, ischemia can be considered as one of the etiologies of acute pancreatitis in this case[10]. Ischemic pancreatitis has been reported after cardiac arrest followed by prolonged resuscitation[11], intra-aortic balloon counter pulsation[12], surgical treatment of thoracoabdominal aortic aneurysm, and pancreatic transplantation[13]. Prolonged duration of aortic clamping[14], renal insufficiency, and administration of calcium chloride are risk factors for pancreatitis[15]. In our case, renal insufficiency was also present. WON, as the name suggests, consists of necrotic debris contained within an enhancing wall of reactive tissue. It is a mature, encapsulated collection of pancreatic and/or peripancreatic necrosis and has a well-defined inflammatory wall[16]. Although WON occurring in relation to in 1%-9% as a local complication of acute pancreatitis[17], WON occurring in relation to aortic disease is rare. A literature search for WON after pancreatitis related to aortic disease and aneurysm was performed from 1979 to March 2024. There were 4 cases of WON related to cardiovascular disease including our case (Table 1)[18-20]. In case 1 and case 2, aneurysms were located in the abdominal aortas. Case 3 and our case had no comorbidity in an abdominal aorta, these cases are considered as ischemic pancreatitis leading to WONs. Since these two cases underwent cardiopulmonary bypass, cardiopulmonary bypass may cause ischemic pancreatitis followed by WONs afterwards. These 4 cases were all in male patients. The gender ratio of WON is slightly higher in males; 56.5%-58.2% of WON were males[21]. In addition, the prevalence of abdominal aortic aneurysms was 3.7-times greater in males than in females[22]. This gender ratio may be the reason why all 4 cases were in male patients. The indication for treatment is considered for patients with symptomatic WON which causes infection, abdominal pain, gastrointestinal obstruction or jaundice. Percutaneous, transpapillary, transluminal, laparoscopic, or open drainage can be performed for the treatment of WON. The step-up approach is usually selected, as it is associated with less incidence of multiple organ failure than open surgery[23]. The step-up approach begins with EUS-guided transluminal drainage, which is less invasive than percutaneous drainage and is related to a lower rate of pancreatic fistula formations and a shorter duration of hospitalization[24]. Furthermore, EUS-guided transluminal drainage as the step-up approach significantly reduced pancreatic fistula, post-procedural systemic inflammatory response syndrome, and the post-procedural length of intensive care unit stay than minimally invasive surgery[25]. Therefore, we performed EUS-guided transluminal drainage as less invasive therapy for the critical postoperative condition. The drainage was initially effective, but deterioration of the WON was observed within a few weeks. In refractory cases after initial drainage, successful secondary interventions using EUS-guided transluminal drainage with 100% success rate without any adverse event have been reported[26]. They performed the secondary intervention with a 100% success rate; in 12 out of 12 cases and without any adverse events. Therefore, we performed the secondary drainage and his gastrointestinal obstruction was successfully resolved without major complications. To the best of our knowledge, this was the first case of WON caused by acute pancreatitis after aortic surgery that was treated successfully with EUS-guided transluminal drainage. Pancreatic-enteric fistula is known to develop after the spontaneous rupture of a pancreatic pseudocyst into an adjacent hollow viscus. This fistula occurs more frequently in the splenic flexure or the transverse colon than in the stomach, duodenum, small bowel, or the extrahepatic biliary tree[27]. The incidence of gastrointestinal fistula in acute pancreatitis was reported to be 12.8% (7.7% involving the colon and 5.7% the duodenum)[28]. Pancreatic-colonic fistulas, treated endoscopically or surgically, were reported in a few cases[20,29-31]. However, fistulas of the upper gastrointestinal tract are usually conservatively managed and have a relatively good prognosis[28,31]. In our case, the duodenal fistula was

managed conservatively with antibiotics.

CONCLUSION

We managed a rare case of WON after aortic surgery treated by EUS-guided transluminal drainage. This case was the 4th report on WON after pancreatitis complicated with cardiovascular disease and was the only case of WON after aortic arch disease.

FOOTNOTES

Author contributions: Inoue Y contributed to conceptualization and manuscript writing; Yata Y contributed to manuscript supervision; Inoue Y and Yata Y contributed to manuscript editing, they contributed equally to this article, they are the co-corresponding authors of this manuscript; Inoue Y, Yokota Y, Li ZL, and Kawabata K contributed to data collection; and all authors critically reviewed the manuscript, approved the final version to be published, and agreed to be accountable for all aspects of the work.

Informed consent statement: As a case report, we obtained written informed consent from the patient regarding the treatment method and the use of his clinical data for clinical study purposes.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

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S-Editor: Bai Y

L-Editor: A

P-Editor: Zhang XD

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