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【 CASE REPORT 】

Hemosuccus Pancreaticus Due to the Rupture of a Pseudoaneurysm That Developed in an Intraductal Papillary Mucinous Neoplasm

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Abstract:
A 76-year-old woman with branch duct intraductal papillary mucinous neoplasm (IPMN) was admitted with epigastric pain and vomiting. She had received warfarin due to a history of deep vein thrombosis. A blood test showed decreased serum hemoglobin and elevated serum amylase. Contrast-enhanced computed tomography revealed acute pancreatitis and formation of a pseudoaneurysm in the IPMN. We suspected rupture of a pseudoaneurysm and performed trans-catheter angiography. Angiography showed extravasation from the posterior superior pancreaticoduodenal artery, and coil embolization was performed. It is important to be alert for the formation of pseudoaneurysm in patients with cystic neoplasms.

Key words: hemosuccus pancreaticus, IPMN, pseudoaneurysm, anticoagulation drug

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Introduction

Hemosuccus pancreaticus (HP) is a rare disease involving bleeding from the papilla of Vater via the pancreatic duct (1). HP is associated with a high mortality rate of 25-40% (2-4); hemorrhagic shock is the most common cause of death (5). HP is mostly caused by acute or chronic pancreatitis, and aneurysms often occur in association with HP. There are a few reports of patients with pancreatic cystic neoplasms that developed HP; surgical treatment was usually performed for the control of HP in those cases.

We herein report a case of HP caused by intraductal papillary mucinous neoplasm (IPMN) with a pseudoaneurysm during anticoagulation drug treatment that was successfully treated with interventional radiography (IVR).

Case Report

The patient was a 76-year-old woman with branch duct IPMN (BD-IPMN) of the pancreatic head that had been followed up regularly with imaging studies twice a year for 8 years (Fig. 1). We also performed endoscopic ultrasonography, but no findings suggestive of malignancy in the IPMN were noted (Fig. 2). She had been treated with warfarin due to a history of deep vein thrombosis. The warfarin dose was 2.25 mg/day and had been optimally controlled for 13 years after she received bilateral total knee arthroplasty. She had no notable family history or drinking habit.

Within seven days before the next follow-up, she was urgently admitted to our hospital with epigastric pain and vomiting. Her heart rate was 85/minute, systolic blood pressure was 145 mmHg, diastolic blood pressure was 85 mmHg, and body temperature was 37.0℃. Her abdomen was soft and flat. She had epigastric pain as well as pain in her back, but no tenderness or rebound was observed. A blood test showed a decreased serum hemoglobin level (12.2 to 10.9 g/dL), elevated serum amylase, and a slightly increased international ratio due to the administration of warfarin (Table 1). Contrast-enhanced (CE) computed tomography(CT) revealed acute pancreatitis and the formation of a pseudoaneurysm in the IPMN (Fig. 3). Based on the sudden onset of her symptoms and the blood test results, we suspected that rupture of a pseudoaneurysm. We performed

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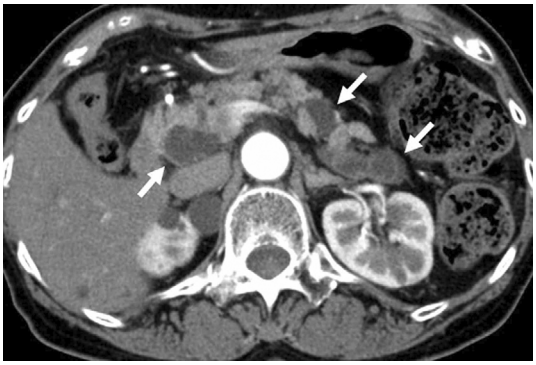

Figure 1. **Contrast-enhanced computed tomography showed multiple cystic lesions suspected of being IPMN in the pancreas (arrows). IPMN: intraductal papillary mucinous neoplasm**

trans-catheter angiography, which revealed extravasation from the posterior superior pancreaticoduodenal artery (PSPA) and performed coil embolization of the PSPA (Fig. 4). Melena was observed three times on the day after the procedure; however, this resolved naturally without the progression of anemia. Based on these findings, we diagnosed the patient with HP caused by the sudden rupture of a pseudoaneurysm.

Her clinical course is shown in Fig. 5. She was discharged on the eighth day after the coil embolization. Follow-up CT revealed that the pseudoaneurysm had been completely treated and that the findings of acute pancreatitis were improved (Fig. 6). Although we recommended surgery (pancreaticoduodenectomy) for the prevention of recurrence of pancreatitis, she refused surgical treatment. Thus, she has been carefully followed up with imaging studies. There have

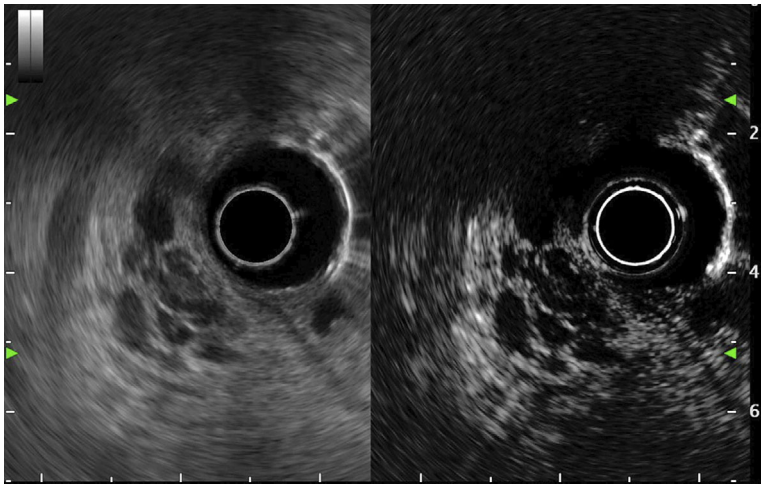

Figure 2. **Endoscopic ultrasonographic findings. Left: B mode, Right: contrast mode. Findings of wall thickening in the IPMN were noted, but there were no nodules on contrast EUS mode. IPMN: intraductal papillary mucinous neoplasm, EUS: endoscopic ultrasonography**

Table 1. **Laboratory Data on the Admission.**

Hematologic test		AST	27 U/L
White blood cells	11,820 /μL	ALT	17 U/L
Red blood cells	3.57×10^6 /μL	ALP	168 U/L
Hemoglobin	10.9 g/dL	γ-GTP	13 U/L
Platelet count	23.9×10^4 /μL	LDH	249 U/L
Coagulation		Amylase	3,568 U/L
PT	33 %	BUN	28.5 mg/dL
PT-INR	1.82	Creatinine	1.06 mg/dL
Fibrinogen	291 mg/dL	Sodium	141 mmol/L
Chemistry		Potassium	4.4 mmol/L
Total protein	6.1 g/dL	Chloride	103 mmol/L
Albumin	4.1 g/dL	CRP	0.68 mg/dL
Total bilirubin	0.67 mg/dL	glucose	161 mg/dL
Direct bilirubin	0.15 mg/dL	HbA1c	6.2 %

PT: prothrombin time, PT-INR: prothrombin time-international normalized ratio, AST: aspartate aminotransferase, ALT: alanine aminotransferase, ALP: alkaliphosphatase, γ-GTP: γ-glutamyl transpeptidase, LDH: lactate dehydrogenase, BUN: blood urea nitrogen, CRP: C-reaction protein, HbA1c: hemoglobin A1c

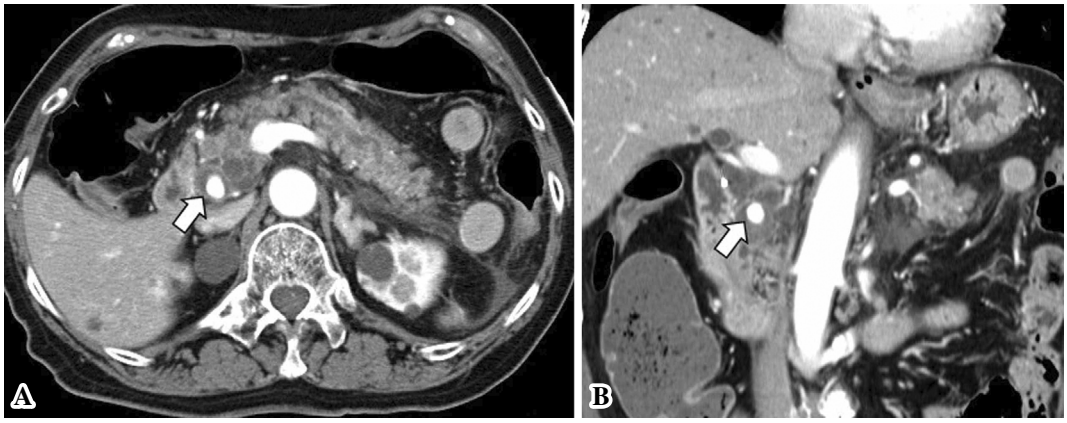

Figure 3. **Contrast-enhanced computed tomography revealed acute pancreatitis and the formation of a pseudoaneurysm in the head of the IPMN. A) Axial image. B) Coronal image. IPMN: intraductal papillary mucinous neoplasm**

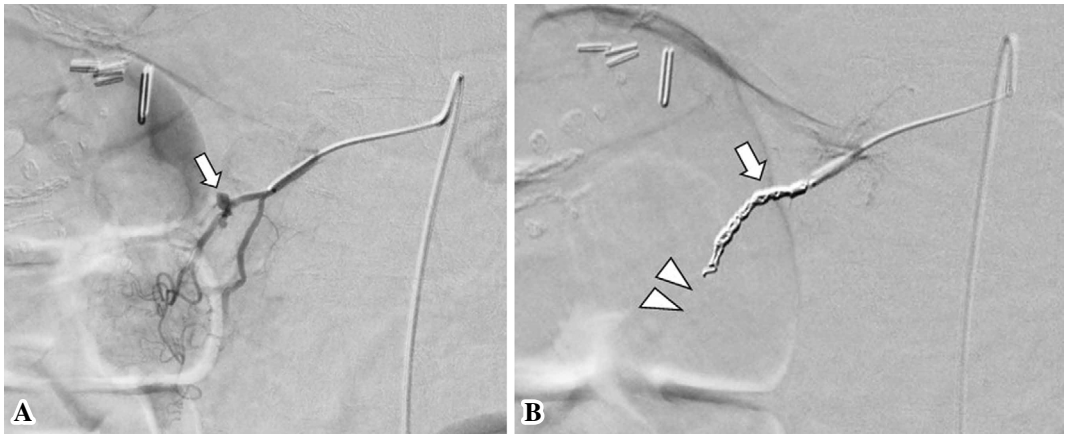

Figure 4. **The angiography findings. A) Extravasation from the pseudoaneurysm at the PSPA (arrow). B) After coil embolization. The aneurysm disappeared (arrow), and the blood flow in the PSPA was blocked (arrowheads). PSPA: posterior superior pancreaticoduodenal artery**

been no events in the year of follow-up.

Discussion

We herein report a rare case of HP caused by IPMN with a pseudoaneurysm during anticoagulation drug treatment. HP due to a pseudoaneurysm caused by a cystic neoplasm of the pancreas is rare. We successfully controlled the bleeding from a pseudoaneurysm using IVR.

According to a review of cases of HP, the main causes of HP are arterial aneurysm, inflammatory changes in the pancreas (acute and/or chronic), and pancreatic tumors (6, 7). Ru Nan et al. summarized 114 HP cases (6), and the causes of HP were pancreatitis in 95 cases (82.6%), pancreatic tumor in 18 cases (16.5%), and congenital pancreatic malformation in 1 case (0.9%). The breakdowns of pancreatic tumors were cystadenoma in 8 cases (7.0%), IPMN in 5 cases (4.3%), endocrine tumors in 2 cases (1.7%), adenocarcinoma in 1 case (0.9%), and carcinoma *in situ* in 1 case (0.9%). Many studies have reported that the direct source of bleeding was a ruptured aneurysm; the most common site of causative aneurysms is the splenic artery (8-10). Aneurysms of the pancreatic and pancreaticoduodenal arteries are rare, accounting for only 2% of all splanchnic artery aneurysms (9), and peripancreatic aneurysms are among the most life-threatening of all splanchnic artery aneurysms (10).

In the diagnosis of HP, esophagogastroduodenoscopy (EGD) is a useful examination for confirming hemorrhaging from the main papilla. However, according to a report by Vimalraj et al. summarizing 31 HP cases, bleeding from the papilla was confirmed in about half of their 16 cases (51%). CE-CT (90%; 28/31) and angiography (88%; 23/26) depicted positive findings for HP (11). Thus, in some cases, bleeding from the papilla could not be detected, and these cases were diagnosed with HP based on other radiographic findings and the clinical course [of note, some cases were diagnosed by surgery (12)]. In the present case, HP was suspected because 1) anemia had progressed according to blood test findings, 2) there was extravasation from a pseudoaneurysm in the IPMN on CE-CT and IVR, 3) there was evidence of acute pancreatitis, and 4) melena appeared in the subsequent clinical course. We therefore diagnosed the pa-

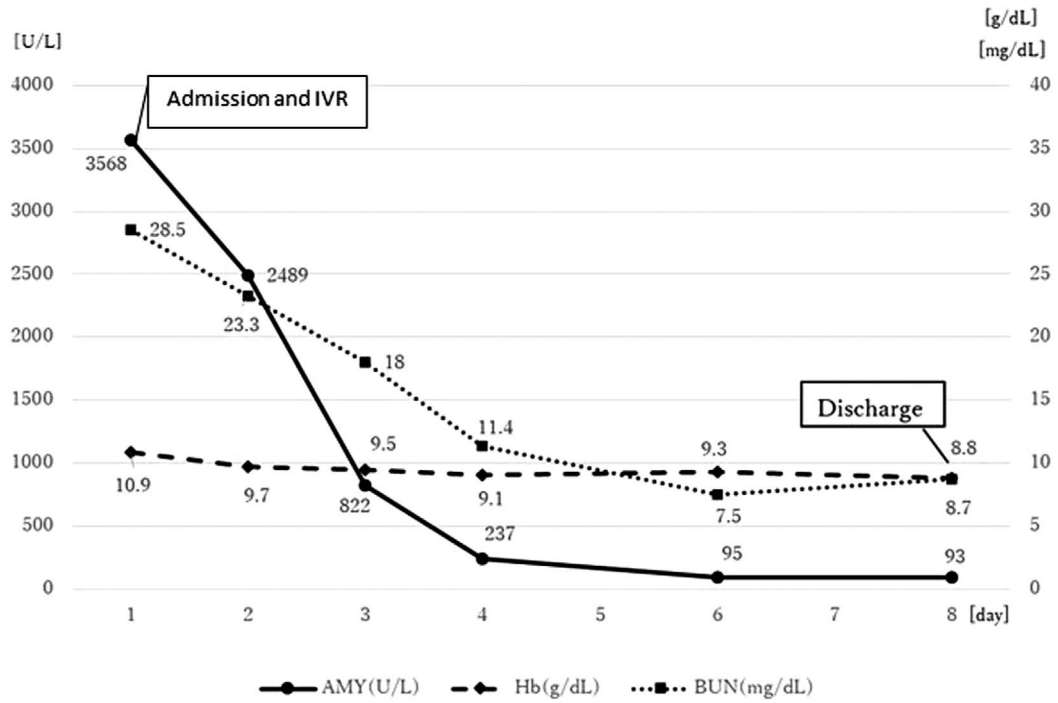

Figure 5. **The clinical course from admission to discharge. IVR: interventional radiology, AMY: amylase, Hb: hemoglobin, BUN: blood urea nitrogen**

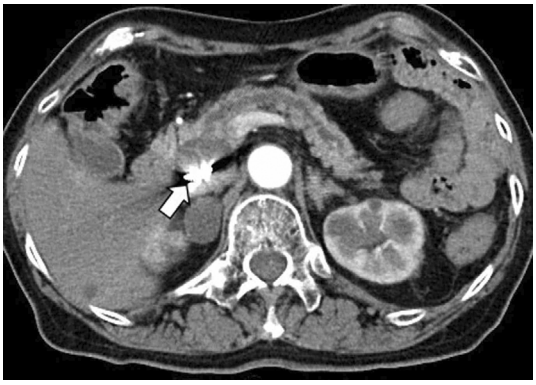

Figure 6. **Follow-up CT revealed that the pseudoaneurysm had been completely treated, and the findings of acute pancreatitis had improved.**

tient with HP based on these radiographic findings and the clinical course.

The main treatments of HP are IVR and surgery. Once the patient is hemodynamically stable, IVR procedures are effective as an initial treatment in 67-100% of cases (13). If the source of bleeding is found on angiography, IVR procedures are the first choice for initial management, with immediate good results in 79-100% of cases and an overall success rate of 67% (14, 15). For patients with hemodynamic instability, emergency operations are inevitable. Distal pancreatectomy is a surgical alternative to IVR procedures for a bleeding pancreatic pseudoaneurysm in the body or tail of the pancreas. However, when the pseudoaneurysm is located in the head of the pancreas, surgical resection is associated with increased mortality and morbidity, and IVR procedures have been proposed as the recommended treatment modality in such cases. In the present case, the patient's vital signs were stable, and the pseudoaneurysm was found in the IPMN at the head of the pancreas. The source of bleeding was found on angiography, and coil embolization was successfully performed. As a result, we were able to control the HP and avoid emergency surgery.

There have been eight reported cases of HP due to pancreatic cystic neoplasms in the relevant literature (16-23) (Table 2). Including our case, 5 cases (56%) were IPMN, and 2 cases each (22%) were mucinous cystic neoplasms and serous cystic neoplasms. The median age was 67 years old, and 4 of the patients (44%) were men. The median tumor size was 31 mm, and most of the tumors were ≥20 mm in diameter. Most of the tumors were located at the pancreatic body or tail. The causes of HP included bleeding from the tumor in 5 cases (56%) and rupture of an arterial pseudoaneurysm in 4 cases (44%). Two cases were treated with an antithrombotic drug. Most cases were treated with surgery, and two cases (including our case) were treated with an IVR procedure. The rupture of a splenic artery aneurysm was mostly seen as the cause of HP, and this is the first reported case with a ruptured PSPA pseudoaneurysm.

IPMN may reportedly cause HP due to rupture of the blood vessel wall in association with concomitant pancreatitis or hemorrhaging associated with tumor necrosis (20). In patients with IPMN, the blood vessel walls are exposed to viscous pancreatic juice. Such long-term exposure can cause the rupture of the elastic fibers in the vessel wall, forming an extravascular circulation space with the fibrous cap and thus creating a pseudoaneurysm (24). In this case, warfarin

Table 2. Hemosuccus Pancreaticus with Pancreatic Cyst Neoplasms.

Reference no.	Age	Sex	Neoplasms			Antithrombotic therapy	Cause of HP	Treatment
			variation	location	size (mm)			
16	57	F	SCN	tail	40	none	rupture of SA aneurysm	surgery
17	71	F	MCN	tail	25	none	tumor bleeding	surgery
18	58	M	IPMN	tail	36	n.d.	rupture of SA aneurysm	surgery
19	35	F	SCN	head/tail	n.d.	none	tumor bleeding	surgery
20	78	M	IPMN	tail	n.d.	antiplatelet (ticlopidine)	tumor bleeding	surgery
21	62	F	MCN	tail	30	none	tumor bleeding	surgery
22	67	M	IPMN	body	n.d.	none	rupture of SA aneurysm	IVR
23	79	M	IPMN	body	12	none	tumor bleeding	surgery
our case	76	F	IPMN	head	31	anticoagulation (warfarin)	rupture of PSPA aneurysm	IVR

HP: hemosuccus pancreaticus, SA: splenic artery, PSPA: posterior superior pancreaticoduodenal artery, SCN: serous cystic neoplasm, MCN: mucinous cystic neoplasm, IPMN: intraductal papillary mucinous neoplasm, IVR: interventional radiology, n.d.: no data, F: female, M: male

was controlled in the therapeutic range, and its involvement in the bleeding from the cyst is unclear. However, a case of HP in which a cystic neoplasm developed under antithrombotic therapy was previously reported (20), so further investigations concerning the relationship between antithrombotic therapy and HP should be conducted in the future.

Conclusions

We encountered a case of HP due to rupture of a pseudoaneurysm in a patient with IPMN. It is important to be alert for the formation of pseudoaneurysms when we follow patients with cystic neoplasms.

The authors state that they have no Conflict of Interest (COI).

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