

Pseudoaneurysm of the gastroduodenal artery following pancreatoduodenectomy. Stenting for hemorrhage

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Abstract

Postpancreatectomy hemorrhage (PPH) and pancreatic fistula are main and serious complications following pancreaticoduodenectomy. Postpancreatectomy hemorrhage is considered life-threatening for its high rate of mortality. Postpancreatectomy hemorrhage is defined as early, occurring within 24 h after surgery, and late. The authors present a case of late PPH which developed in the third week following pylorus-preserving pancreaticoduodenectomy. A 58-year-old man was operated on for cancer of the pancreatic head. Hemorrhage occurred when the patient was in full health, convalescing at home. The cause was bleeding from a pseudoaneurysm of the stump of the gastroduodenal artery directly into the gastrointestinal tract. Diagnosis was established based on computed tomography angiography. Treatment was performed using minimally invasive technique during angiography. The implantation of a stent graft into the common hepatic artery for bridging the stump of the gastroduodenal artery was performed. This method thus enabled at once both diagnosis and successful minimally invasive treatment.

Key words: pancreaticoduodenectomy, hemorrhage, stents, pseudoaneurysm.

Introduction

Hemorrhage, along with pancreatic fistula, is one of the main and most serious complications of pancreatoduodenectomy, which affects the morbidity and mortality of this procedure. Based on the efforts to classify specific complications of pancreatic surgery, it is termed postoperative pancreatic hemorrhage (PPH). Although it is not among the most frequent complications after pancreatectomy, it is considered life-threatening for its high mortality. Postpancreatectomy hemorrhage is defined as early, developing within 24 h from the operation, and late, developing 24 or more hours following the operation [1, 2].

The authors present a unique complication of this type – bleeding into the gastrointestinal tract from an

pseudoaneurysm of the stump of the gastroduodenal artery – in their set of 200 consecutive pancreatoduodenectomies in a 6-year period from 2006 to 2011.

Case report

A 58-year-old hypertensive man without previous history of gastroenterological disorder or pancreatic disease was admitted with acute pancreatitis to the surgery department of a district hospital. Biliary or toxonutritive etiology of the pancreatitis was not established. The laboratory values at admittance are shown in Table I. Ultrasonography was not beneficial. CT showed a mass in the head of the pancreas 34 mm × 34 mm. Oncomarkers were without pathological values. Positron emission tomography-com-

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Table I. Laboratory values at admittance

WBC	12.79	BILI	19
RBC	5.31	AMS	22.38
HGB	164	AST	0.55
HCT	0.491	ALT	0.56
PLT	188	ALP	1.29
		CRP	3.43

WBC – white blood cells, RBC – red blood cells, HGB – hemoglobin, HCT – hematocrit, PLT – platelets, BILI – bilirubin, AMS – amylase, AST – aspartate aminotransferase, ALT – alanine aminotransferase, ALP – alkaline phosphatase, CRP – C-reactive protein

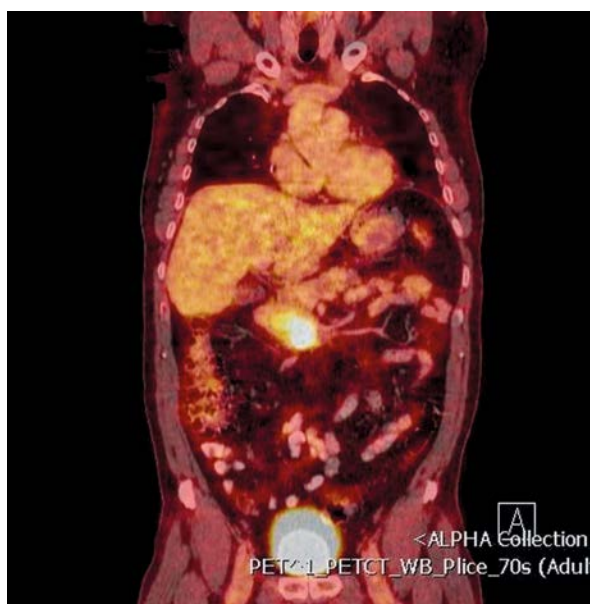


Photo 1. PET-CT examination with a lesion in the head of the pancreas 33 mm × 26 mm × 29 mm accumulating 16-FDG

puted tomography (PET-CT) examination confirmed a lesion in the head of the pancreas 33 mm × 26 mm × 29 mm accumulating 16-FDG (fludeoxyglucose), without signs of disease dissemination (Photo 1). Based on these findings, diagnosis of tumor of the pancreatic head was established, preoperatively T2N0M0. Surgical resection was recommended.

Standard pylorus-preserving Traverso-Longmire pancreatoduodenectomy was performed. The pancreatic duct was thin, and the pancreas had a fine structure, without fibrous component. Blood loss perioperatively was 400 ml. Antibiotic prophylaxis was administered in three doses (amoxicillin + potassium clavulanate). Due to postoperative hyperamylasemia, octreotide was administered for a total of 5 days in

a dose of 3 × 0.1 ml subcutaneously. On the 5th day, the patient began receiving nutrition p.o. – first liquids, then gradually a pancreatic diet. Secretion from the drains was of minimal volume, without the presence of amylases – nothing signaling pancreatic fistula – the drains were removed on the 6th postoperative day. Histology findings described a moderately differentiated ductal adenocarcinoma pT3N0M0 with perineural invasion, without lympho- or angioinvasion.

The patient was discharged from the hospital on the 11th postoperative day in good condition. Postoperative complications were classified as grade II (DeOliveira, Clavien-Dindo), necessitating antibiotic and somatostatin analog administration, without having an effect on length of hospital stay [3, 4]. Blood count before discharge: WBC 14.85, RBC 4.47, HGB 136, HCT 0.38, PLT 287. On the 16th postoperative day at outpatient follow-up the patient felt good, was without any problems, realimented. Proton pump inhibitor (omeprazole) administration and substitution of exocrine secretion of the pancreas was initiated postoperatively as routine medication following resection of the pancreas.

On the 18th postoperative day, sudden upper abdominal pain appeared, with chills, shivers and nausea. The patient came to the emergency room and laboratory tests showed HGB 112, RBC 3.84, WBC 10.6, HCT 0.32, PLT 483, BILI 12.7, AMS 4.25, CRP 55, ALT 0.8, AST 1.77, ALP 3.47, Q 64%, INR 1.39, aPTT 24.8. Spasmolytics and analgesics were administered; however, shortly after admission melena appeared. Esophagogastroduodenoscopy revealed subcardial erosions, digested blood in the stomach, coagula, and stagnation fluid. Acute bleeding was not seen. The examination did not show any other source of bleeding. Blood transfusions and *i.v.* anti-ulcer therapy were administered and the possible source of bleeding was sought. Computed tomography revealed a mass adjoining the stump of the gastroduodenal artery. Other pathology was not discovered. Due to the continued bleeding, a CT angiography of the abdominal aorta was performed, and a pseudoaneurysm of the stump of the gastroduodenal artery was discovered as a potential source of bleeding into the gastrointestinal tract (Photos 2 and 3). The portal vein was patent. Angiography of the splanchnic arterial system confirmed bleeding from the stump of the gastroduodenal artery, which created the pseudoaneurysm. This subsequently bled into the gastrointestinal tract, most probably at



Photo 2. CT angiography – pseudoaneurysm of the stump of the gastroduodenal artery – volume rendering reconstruction

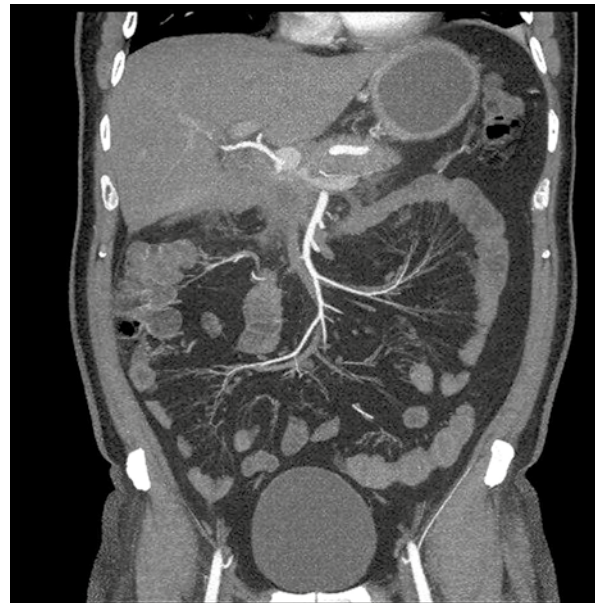


Photo 3. CT angiography – pseudoaneurysm of the stump of the gastroduodenal artery – coronal reconstruction

the pancreaticojejunal anastomosis. Possible treatment options considered: 1. Embolization of the gastroduodenal artery stump [5, 6], 2. Implantation of a stent graft into the common hepatic artery to bridge the bleeding arterial stump (Photo 4) [7], 3. Surgical procedure with resection of the bleeding pseudoaneurysm and ligation of the gastroduodenal artery stump [8, 9].

Implantation of a stent graft was selected. Embolization of the short stump presented a high risk of migration of the embolization material into the hepatic vascular network and surgical intervention shortly after the primary procedure was reserved as the most invasive treatment in case of failure or inability to perform minimally invasive stent-graft implantation. Successful implantation of the Jostent peripheral stent graft (ABBOTT, Rangendingen, Germany) was confirmed on arteriography after its definitive expansion (Photo 4). After the procedure, the patient was under observation at the intensive care unit, where there were no signs of continued hemorrhage, the patient had stable vital signs, the melena ceased and follow-up endoscopy showed no signs of hemorrhage in the upper gastrointestinal tract. The patient received antiaggregation therapy, which was selected based on the patient's resistance to acetyl-



Photo 4. Arteriography of hepatic artery with implanted stent graft

salicylic acid; thus clopidogrel was added to the patient's chronic medication. During hospitalization, 7 blood transfusions were administered within 48 h. Currently the patient is 1 year after the surgery and

Table II. Classification of PPH according to ISGPS – adapted from Wente, Grützmann [1, 2]

Grade	Time of onset Location <hr/> Clinical impact	Clinical condition	Diagnosis	Treatment
A	Early <hr/> Intra- or extraluminal <hr/> Mild	Well	Observation, blood count, ultrasonography, CT	No
B	Early <hr/> Intra- or extraluminal <hr/> Severe <hr/> Late <hr/> Intra- or extraluminal <hr/> Mild	Often well/intermediate, very rarely life-threatening	Observation, blood count, ultrasonography, CT angiography endoscopy	Transfusion of fluid/blood, ICU, therapeutic endoscopy embolization relaparotomy for early PPH
C	Late <hr/> Intra- or extraluminal <hr/> Severe	Severely impaired, life-threatening	CT, angiography, endoscopy	Localization of bleeding, angiography, embolization or stenting endoscopy or relaparotomy ICU

after stent implantation, is without any problems and has completed postoperative radiochemotherapy according to plan without any delay.

Discussion

The authors present a previously undocumented type of bleeding complication in their set of 200 consecutive right-sided pancreatoduodenectomies over a 6-year interval. Based on a review of literary sources and personal experiences with the treatment of pancreatic surgery complications, late hemorrhage occurs in association with troublesome healing of the pancreaticojejunal anastomosis with presence of fistula or dehiscence of pancreaticojejunal anastomosis. The source of bleeding is a pseudoaneurysm which develops during intraabdominal sepsis or abscess or hemorrhaging ulcer. This complication is well known, although very infrequent, the incidence is 3.9% and it is lethal in one-third of patients [10]. In cases of hemorrhage after pancreatoduodenectomy, one third involve bleeding into the gastrointestinal tract, in two thirds into the abdominal cavity. Bleeding into the gastrointestinal tract occurs from ulcers in the anastomosis, from the resection margin or from perforation of a pseudoaneurysm during anastomotic leakage [7]. The anastomotic leak or collection is presented in two thirds of delayed arterial hemorrhage cases after pancreatoduodenectomy [7, 10].

Large patient sets report a nearly 30% incidence of PPH (according to ISGPS – International Study Group of Pancreatic Surgery) and 3% incidence of hemorrhage from perforated pseudoaneurysm [9, 11]. Late hemorrhage, especially from a ruptured pseudoaneurysm, is rare, but rapidly progresses. It is potentially a life-threatening complication after pancreatoduodenectomy. There were no clinical signs of pancreatic fistula in the reported patient. However, beside possible trauma to the vessel wall intraoperatively (electrocoagulation, mechanical trauma, etc) it is one of the main possible causes of pseudoaneurysm development. Diagnosis was established based on clinical signs of hemorrhage, CT and CT angiography, during sentinel bleeding. The selected treatment method – stent graft implantation to bridge the bleeding aneurysm – led to immediate resolution of the complication by a minimally invasive method. According to the PPH classification (Table II) this complication was scored as grade B.

Conclusions

An unusual complication – late postoperative pancreatic hemorrhage – was caused by rupture of a pseudoaneurysm of the stump of the gastroduodenal artery in an otherwise uncomplicated postoperative course following resection of the pancreatic head. Bleeding was exclusively manifested by me-

na as sentinel bleeding in a stable patient. Hemorrhage into the abdominal cavity does not occur. This enables elegant and very effective treatment by minimally invasively implanting a stent graft into the hepatic artery so as to almost immediately stop the bleeding and leads to stabilization of the patient and a definitive solution of the developed complication without the need for relaparotomy and a possibly extensive surgical procedure.

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