Prepancreatic postduodenal portal vein: a case report and review of the literature

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Abstract

Background: Prepancreatic postduodenal portal vein is extremely rare, with only 13 cases reported in the literature.

Case presentation: A 55-year-old white woman presented to our emergency department with abdominal pain. She underwent a computed tomography of her abdomen, which showed a portal vein coursing anterolaterally to her pancreas and posteriorly to the first portion of her duodenum, constituting a prepancreatic postduodenal portal vein. Imaging revealed choledocholithiasis, requiring endoscopic sphincterotomy, but due to a history of a gastric bypass procedure, she was lost to follow-up after being referred to an advanced endoscopist. This represents the 14th reported case of prepancreatic postduodenal portal vein.

Conclusions: Awareness of this rare anomaly is paramount, and will help surgeons and interventional radiologists to avoid complications related to inadvertent injury to the portal vein, which could be life-threatening.

Keywords: Portal vein, Anomaly, Pancreatic surgery, Case report, Literature review

Background

Anatomical variants of the portal vein (PV) are rare and one of the least common of these is the development of a prepancreatic postduodenal portal vein (PPPV), an anomaly in which the PV lies anterior to the pancreas and posterior to the duodenum instead of being posterior to both the pancreas and the duodenum. Awareness of this very rare anomaly is very important especially prior to any surgical or percutaneous interventions involving the biliary tree, liver, or pancreas, to avoid potentially devastating injuries to the PV which could result in liver ischemia or massive hemorrhage. We found only 13 cases reported in the literature, and add this 14th case [1–12].

Case presentation

A 55-year-old white woman presented to our emergency department with acute onset of abdominal pain, which was associated with nausea and multiple bouts of emesis. Her past medical history included deep venous thrombosis currently treated with warfarin and a history of rheumatoid arthritis. She stopped smoking tobacco 10 years prior to presentation and she denied any significant alcohol intake. She had no relevant environmental exposures. Her past surgical history was significant for a Roux-en-Y gastric bypass (RYGB).

On examination her vital signs were normal. She was alert and oriented to person, place, and time. Her memory and speech were normal. Her strength was normal and symmetric. Her sclerae were anicteric. Her breathing was nonlabored and her breath sounds clear. An abdominal examination was unremarkable except for abdominal pain in her right upper quadrant, without evidence of guarding and a negative Murphy's sign. A laboratory evaluation showed an elevated white blood cell count of 14.4 K/mm³ on admission and 7.62 K/mm³ on discharge. Aspartate transaminase, alanine transaminase, and alkaline phosphatase were 551 U/L, 256 U/L, and 144 U/L respectively, on admission, peaking at 2195 U/L, 1244 U/L, and 201 U/L 1 day later, and normalizing by discharge 3 days later: 101 U/L, 258 U/L, and 180 U/L. Her bilirubin was 0.9 mg/dL on admission and discharge, having peaked at 3.6 mg/dL 2 days after admission. Right-upper-quadrant ultrasound showed evidence of a gallbladder wall measuring 3.7 mm in thickness. She also underwent a computed tomography (CT) of her abdomen and pelvis, which showed her PV to be coursing anterolaterally to her pancreas and posteriorly to the first portion of her duodenum (Figs. 1, 2, and 3).
Magnetic resonance cholangiopancreatography showed a filling defect in her common hepatic duct. Due to her altered upper gastrointestinal anatomy following RYGB, an attempt to perform endoscopic retrograde cholangiography (ERC) was unsuccessful. Instead she underwent placement of a percutaneous gastrostomy tube to her remnant stomach in preparation for a transabdominal antegrade ERC. Unfortunately, she subsequently left town and was lost to follow-up. She was, however, reached by phone and reported that an ERC was eventually performed, the duct was cleared, and the gastrostomy tube removed, but other details of her case were unknown and unobtainable.

**Fig. 1** Axial images of computed tomography scan of the abdomen. The images show the portal vein in between the duodenum and the pancreatic duct. Three sequential cuts shown: a–c caudal to cephalad. PD pancreatic duct, PV portal vein

**Fig. 2** Coronal images of computed tomography of the abdomen. The images show linear configuration of the portal vein and common bile duct, with the pancreatic duct coursing posterior to the portal vein. Three sequential cuts shown: a–c anterior to posterior. CBD common bile duct, PD pancreatic duct, PV portal vein

**Fig. 3** Sagittal images of computed tomography of the abdomen. The images show the pancreatic duct coursing posterior to the portal vein. Three sequential cuts shown: a–c right to left. PD pancreatic duct, PV portal vein
**Discussion**

PPPV is a rare anomaly first described in 1972 by Brook and Gardner. It was discovered incidentally during exploration for choledocholithiasis [12]. Only 13 more cases, including ours, have since been reported with most of the reports coming from Japanese groups (Table 1). It is most commonly found incidentally during diagnostic imaging (11/14) and the rest were found during exploration for unrelated pathology (3/14). This variation is much rarer as compared to other PV anomalies including preduodenal PV, which was first described by Knight in 1921 [13]. The existence of many diverse rare anomalies and variants, especially those with potential clinical ramifications such as PPPV, lends support to the argument for subspecialist radiologists [14], who are more likely to accurately describe these cases.

The embryogenesis of the PV was described in 1969 by Marks [15]. During the fourth week of gestation, venous blood from the gut is drained by two vitelline veins (right and left), which are connected by three anastomoses (Fig. 4): one cranial, one middle, and one caudal. The cranial and caudal anastomoses are ventral to the duodenum, whereas the middle anastomosis is dorsal to the duodenum. During fetal development regression occurs of the cranial anastomosis becomes the left PV and the cranial segment of the left vitelline vein regress along with the caudal anastomosis. The pancreatic buds rotate in a clockwise fashion (viewed from caudal perspective) and fuse together resulting in a portal vein in the usual position posterior to the duodenum and the pancreas. C1 caudal anastomosis, C2 cranial anastomosis, D duodenum, DP dorsal pancreatic bud, LPV left portal vein, LVV left vitelline vein, M middle anastomosis, P pancreas, PV portal vein, RVV right vitelline vein, VP ventral pancreatic bud.

**Table 1** Cases of prepancreatic postduodenal portal vein

| Author | Year | Age and Gender | Principle Diagnosis | How it was discovered |
|--------|------|----------------|---------------------|-----------------------|
| Brook and Gardner [12] | 1972 | 84 F | Choledocholithiasis | Laparotomy |
| Matsumoto et al. [6] | 1983 | 64 M | Carcinoma of the bile duct | Laparotomy |
| Dumeige et al. [11] | 1989 | 49 M | Chronic pancreatitis | Laparotomy |
| Matsui et al. [7] | 1995 | 66 F | Carcinoma of the bile duct | PV |
| Yasui et al. [5] | 1998 | 65 M | Cecal cancer | PV |
| Ozeki et al. [4] | 1999 | 62 F | Liver metastasis from rectal cancer | CT scan |
| Tanaka et al. [3] | 2000 | 61 M | Carcinoma of the bile duct | CT scan |
| Inoue et al. [10] | 2003 | 50 M | Gastric cancer | CT scan |
| Jung et al. [2] | 2005 | 28 F | Cholelithiasis | CT scan |
| Tomizawa et al. [8] | 2010 | 74 M | Colorectal metastasis to the liver | CT scan |
| | | 74 F | Breast cancer | CT scan |
| Jain et al. [9] | 2013 | 56 F | Autoimmune hepatitis | CT scan |
| Shimizu et al. [1] | 2014 | 85 F | Carcinoma of ampulla of Vater | CT scan |
| Current case | 2016 | 55 F | Choledocholithiasis | CT scan |

CT computed tomography, F female, M male, PV portal venogram
dorsal pancreatic bud lies caudal, not cephalad, to the middle anastomosis and dorsal, not ventral, to the left vitelline vein. During the normal clockwise (viewed from above or cephalad) rotation of the ventral bud of the pancreas, the PV will come to lie anterior to the pancreas and posterior to the duodenum. In most of the cases the PV courses in an L-shape or reverse L-shape pattern (Fig. 5) [6]. However, in the more frequent anomaly, a preduodenal PV (where the PV lies anterior to the duodenum), it is usually associated with malrotation of the gut. In this preduodenal anomaly, the dorsal pancreatic bud usually lies in the usual location, cranial to the middle anastomosis. During rotation of the ventral pancreatic bud, the middle anastomosis regresses and the caudal one – which is ventral to the duodenum – becomes the PV (Fig. 6) [16].

Conclusions
Despite the rarity of PPPV, familiarity of this anomaly is paramount. Knowledge of this anatomic variation and other PV anomalies will help surgeons and interventionalists to avoid catastrophic complications related to inadvertent injury to the PV resulting in massive hemorrhage or ischemic complications to the liver or bowel.

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Availability of data and materials
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Authors’ contributions
SC conceived of the project. NG and SC participated in the design of the study. NG and SC participated in its design and coordination and helped to draft the manuscript. Both authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

Consent for publication
Written informed consent was obtained from the patient for 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.

Ethics approval and consent to participate
This project was reviewed and approved by the Saint Agnes Institutional Review Board, consistent with Policy Number 7.8 on Case Reports.

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