CIRA Case of the Month

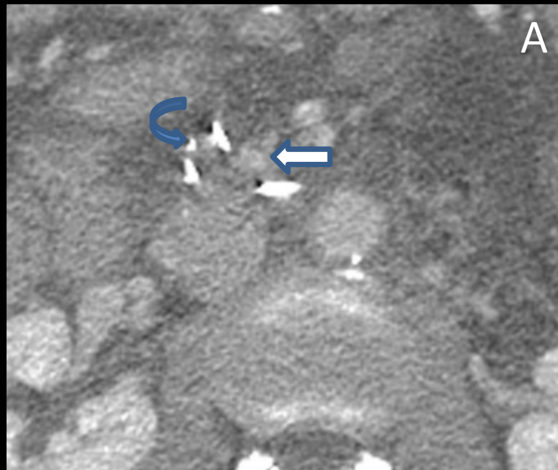
Case Courtesy of Drs. H. Baydoun, A. Bessissow, D. Valenti and L. Boucher
McGill University

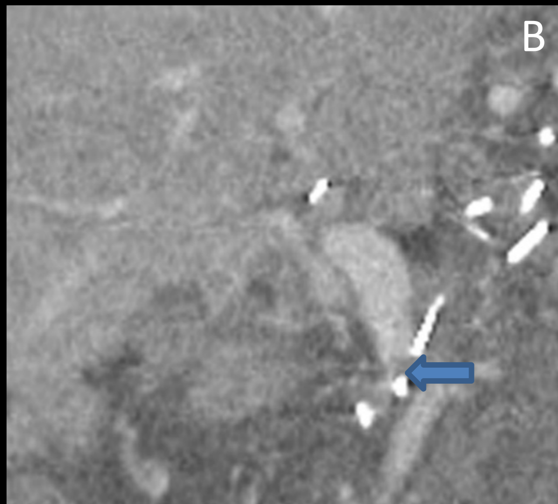
HISTORY

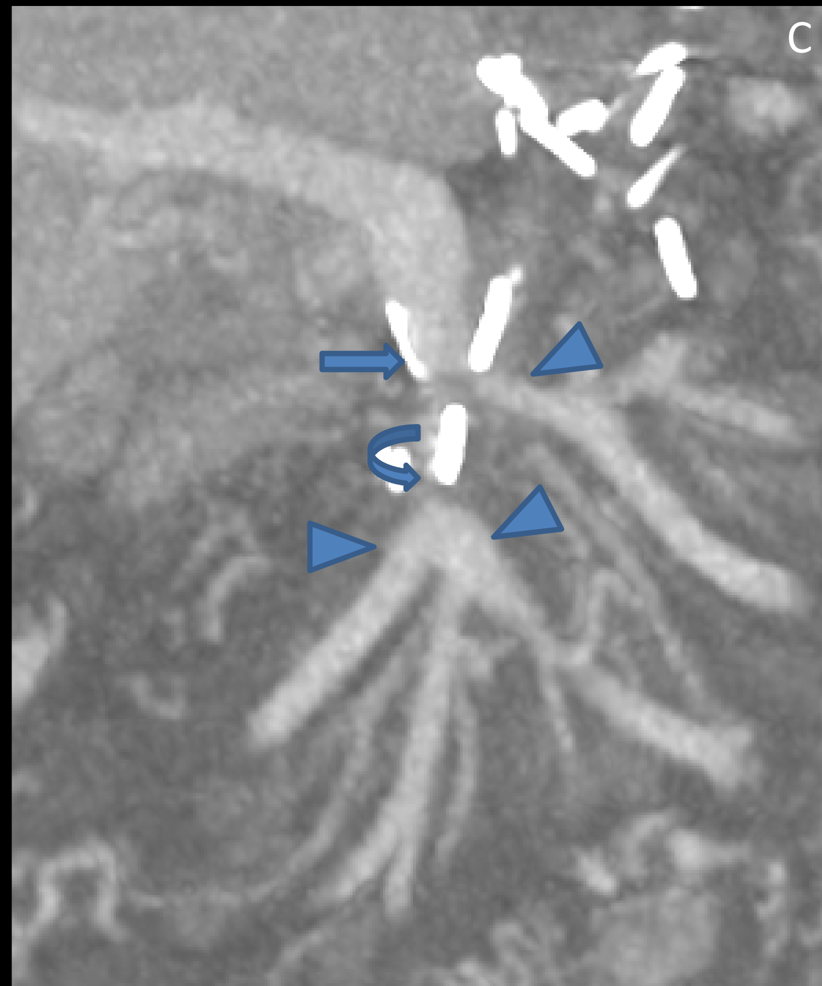
- 59-year-old man with a history of locally advanced pancreatic adenocarcinoma
  - Pancreatic head with portal vein and superior mesenteric vein involvement
- Surgical history:
  - Whipple's procedure (September 2014):
    - Complete pancreatectomy, splenectomy, cholecystectomy and right hemicolectomy
    - Vascular reconstruction with anastomosis of PV to SMV trifurcation
      - The 2 most right branches of the SMV were anastomosed end-to-end with the PV
      - The left-most branch of the SMV was anastomosed end-to-side with the PV

INITIAL PRESENTATION

Presented in April 2016 with lower GI hemorrhage





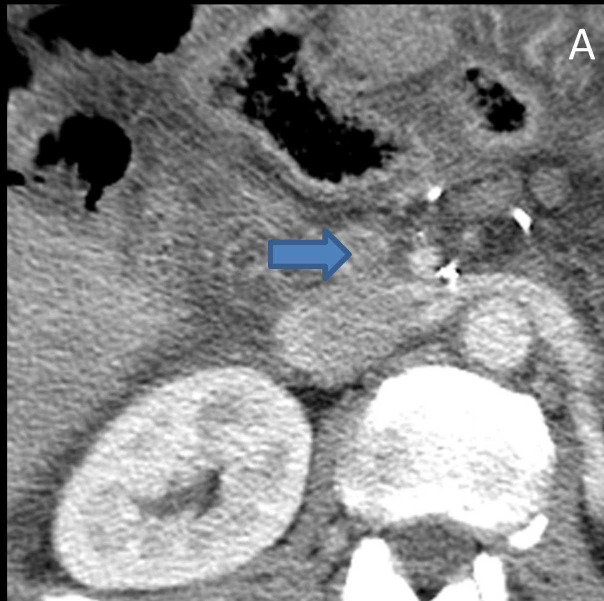


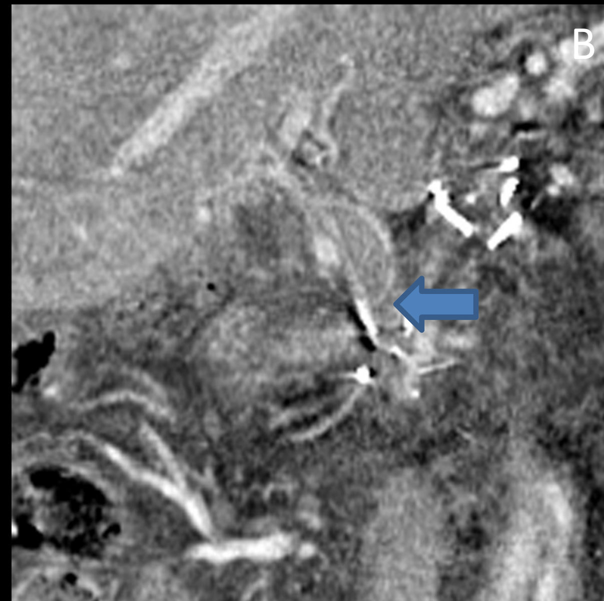
INITIAL PRESENTATION

- CT scan findings:
  - Axial (A), coronal (B) and coronal MPR (C) CT scan of the abdomen in April 2016 shows tapering (blue arrow) and severe stenosis (curved arrow) of the portal vein at the level of the anastomosis
  - Patent post-stenotic SMV branches (arrowheads) are visualized
  - Patent SMA is visualized adjacent to the anastomosis site (white arrow)
- Gastroscopy showed non-bleeding varices
- Colonoscopy showed findings suggestive of venous congestion
- Treated conservatively and discharged in stable condition

REPEAT CT SCAN (OCTOBER 2016)

The patient represented to an outside institution with upper GI bleeding, and underwent a repeat CT scan of the abdomen

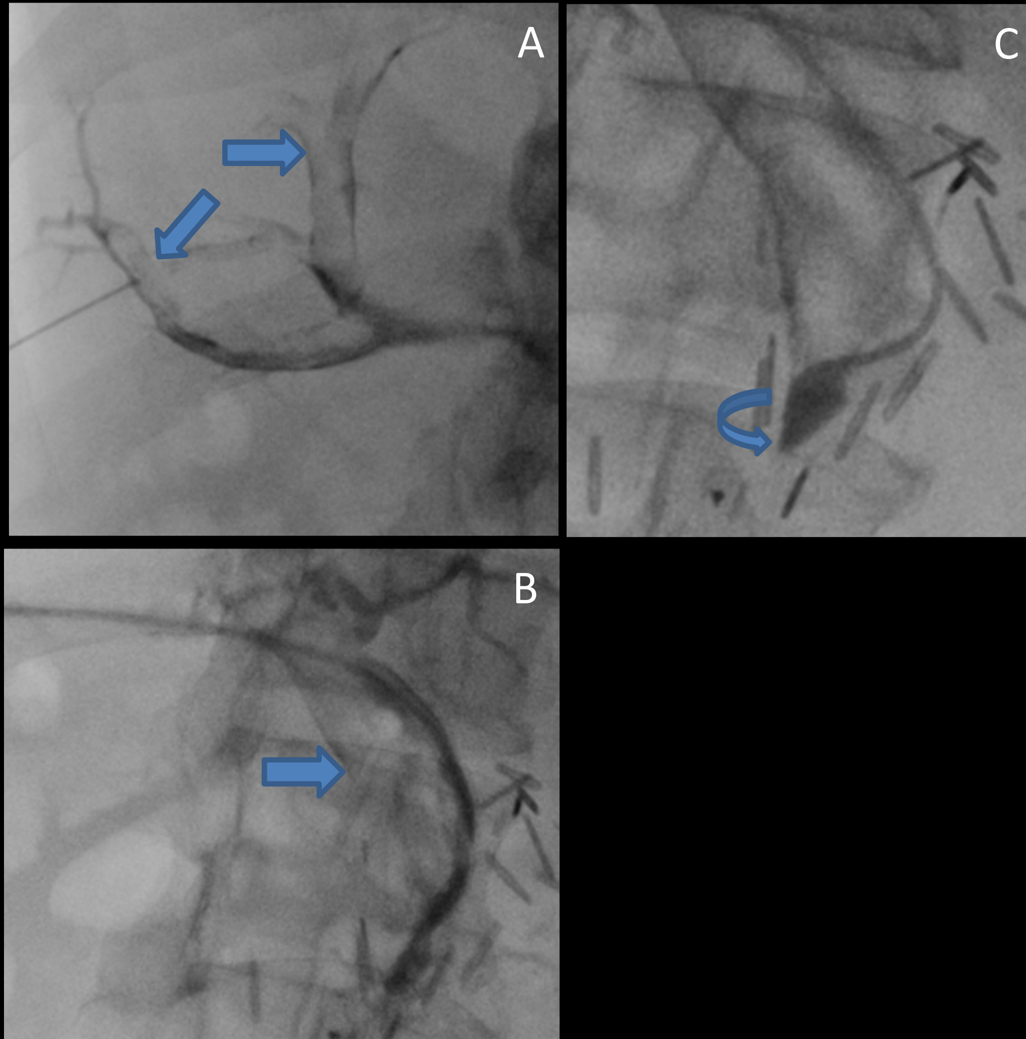




REPEAT CT SCAN (OCTOBER 2016)

- Axial (A) and coronal (B) CT scan of the abdomen in portal venous phase demonstrates an occlusive portal vein thrombosis just downstream to the anastomosis site
- The SMV branches remain patent (not shown)
- Upper GI endoscopy was unsuccessful at controlling the hemorrhage
- Deteriorating liver function
- Interventional Radiology was consulted

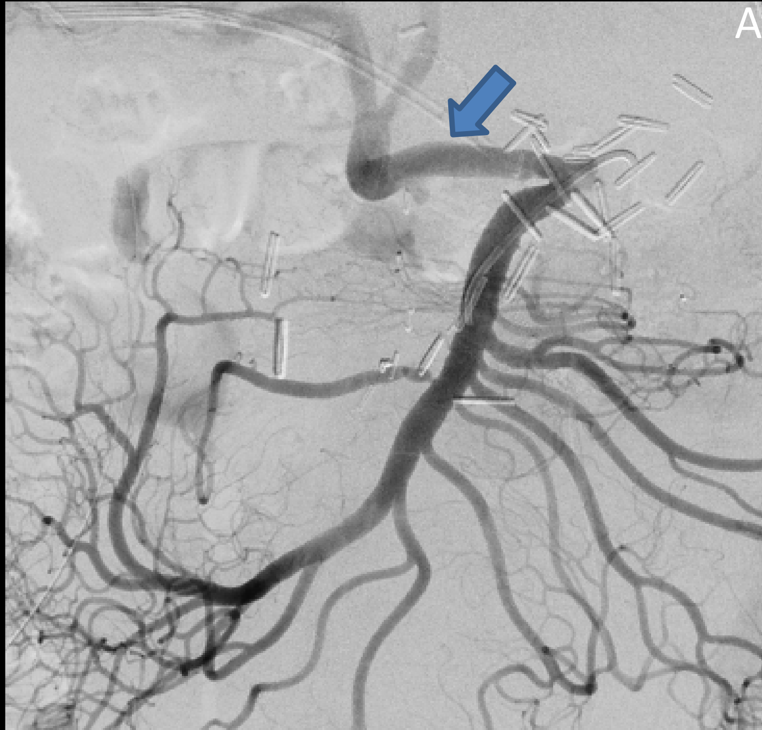
PROCEDURE

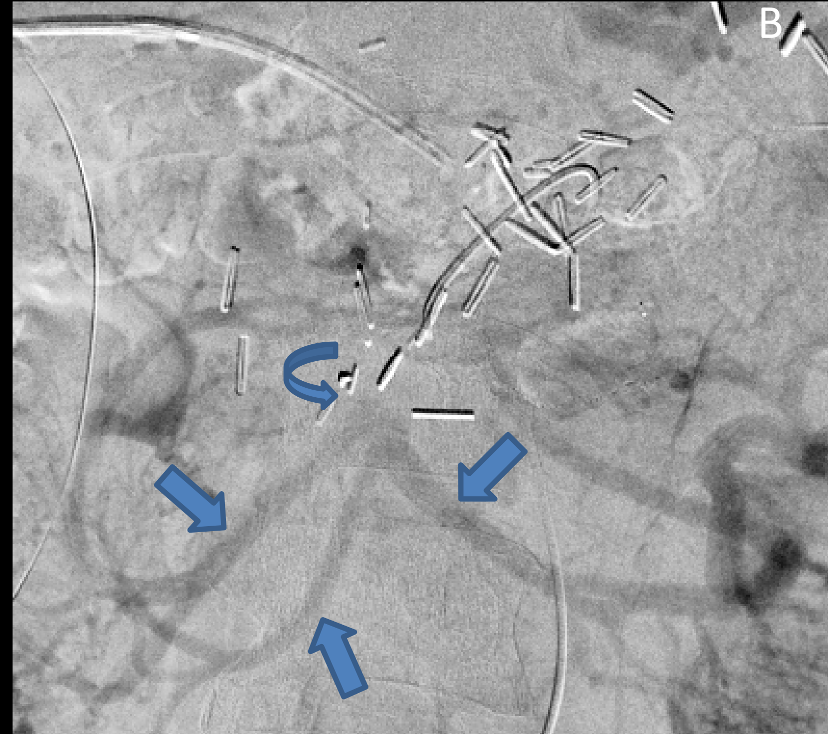


PROCEDURE

- Percutaneous retrograde access of the portal vein was obtained
- A direct portal venogram demonstrated peripheral (A) and central (B) portal vein thrombosis (solid arrows), extending to the anastomosis, with complete occlusion of the PV-SMV anastomosis
- There is tapering and complete occlusion of the portal vein at the anastomotic site (curved arrow, C)
- Retrograde recanalization through the portal vein was unsuccessful

PROCEDURE

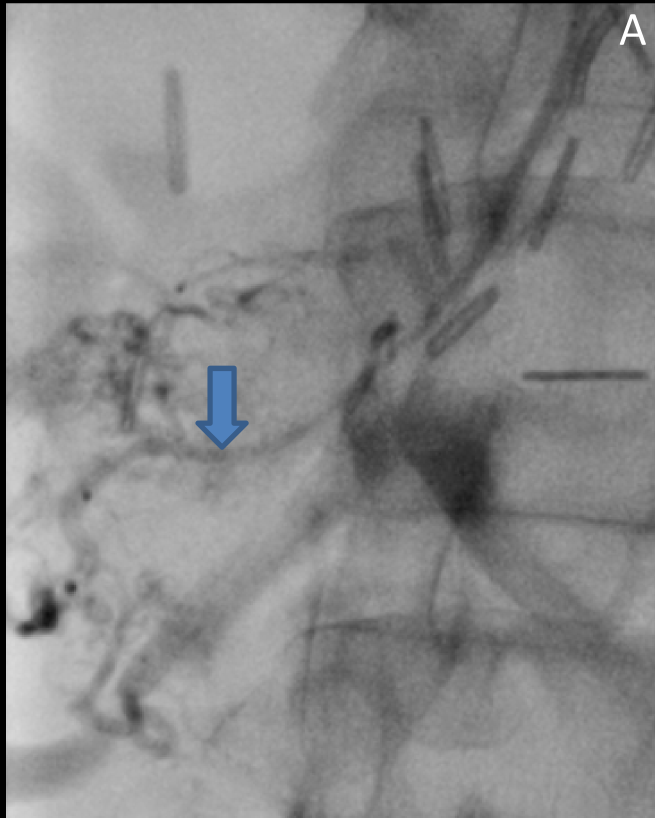


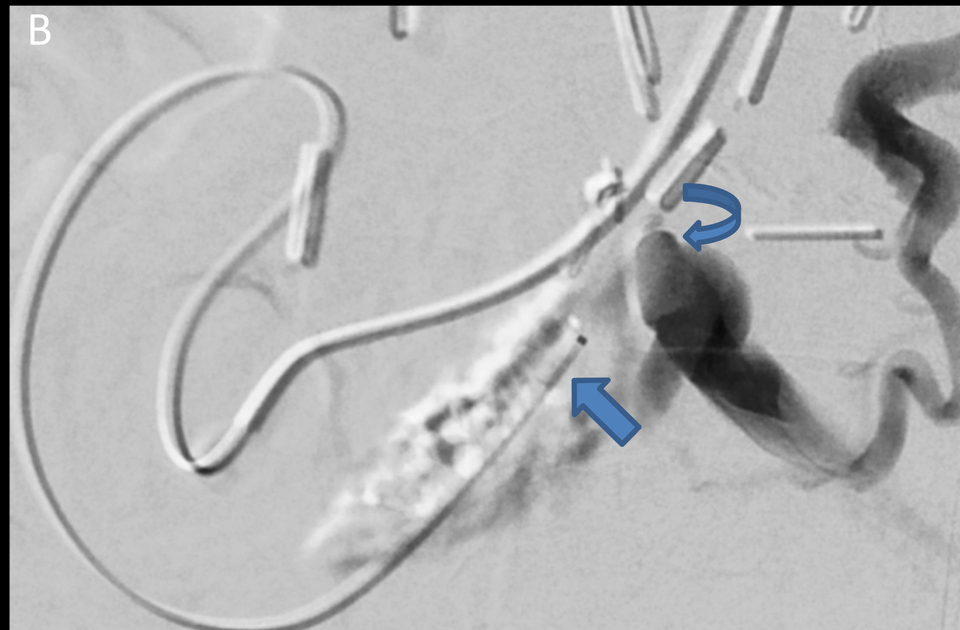


PROCEDURE

- Arterial access was obtained and an indirect portal venogram was subsequently performed through the SMA (A, arterial phase)
- There was complete occlusion of the PV-SMV anastomosis (B, venous phase)
- The 3 branches of the SMV are visualized (arrows in B), with lack of opacification downstream to the anastomosis (curved arrow in B)
- Note the enlarged replaced hepatic artery (arrow in A)

PROCEDURE

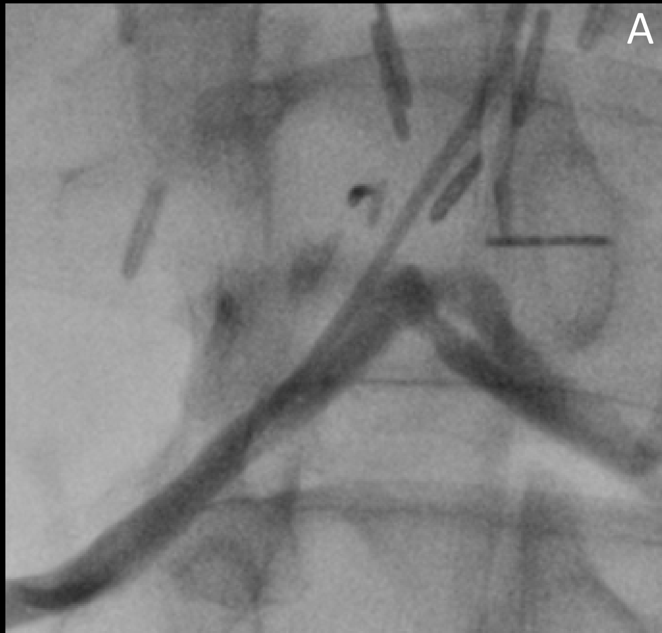


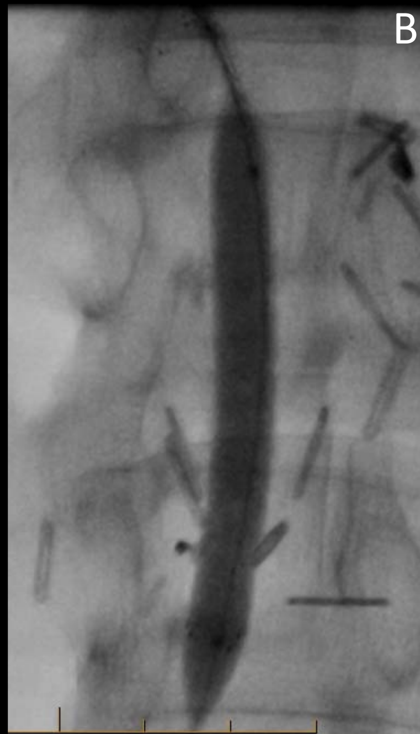


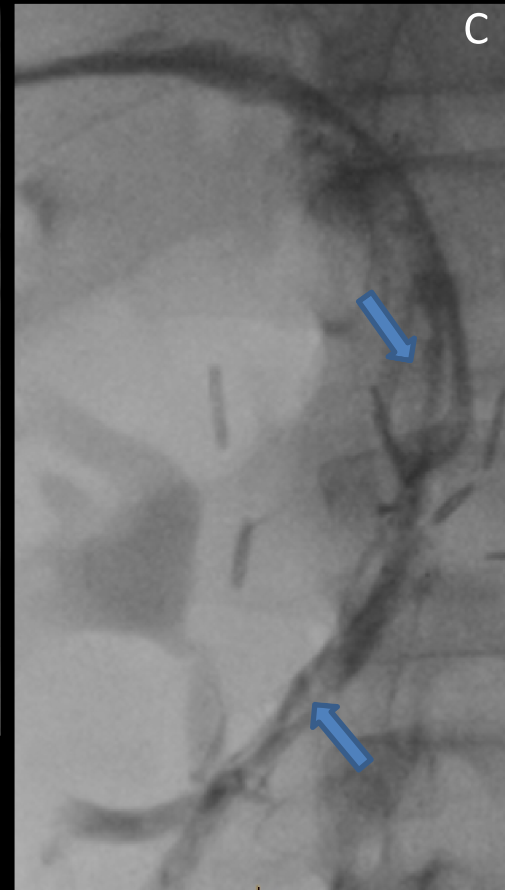
PROCEDURE

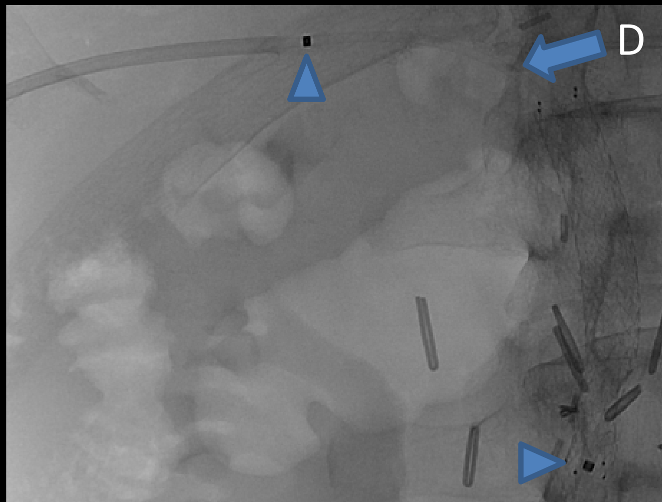
- Through a retrograde portal vein approach, a tiny collateral vein arising from the PV and leading to the SMV was identified (arrow in A)
- The collateral vein was catheterized (arrow in B), allowing access to the SMV upstream to the occlusion
- The SMV, up to its occlusion, was opacified through this approach (curved arrow in B)
- Antegrade recanalization through the SMV was unsuccessful

PROCEDURE





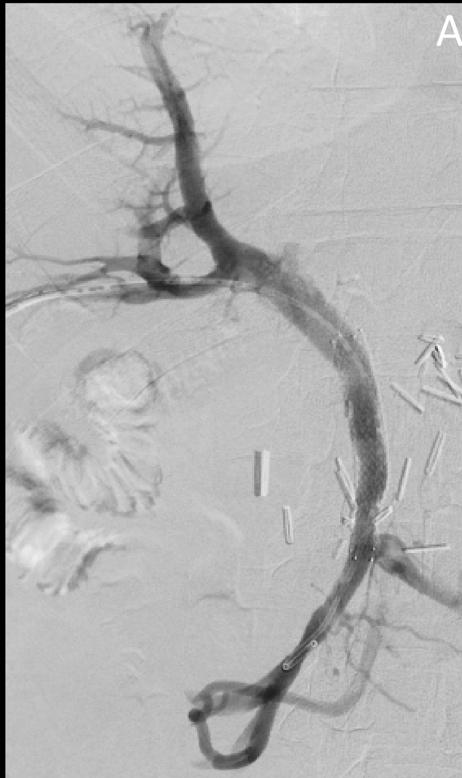


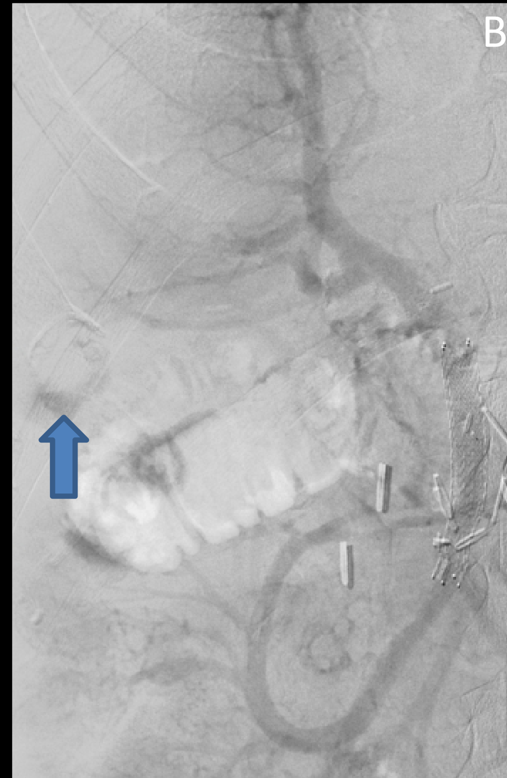


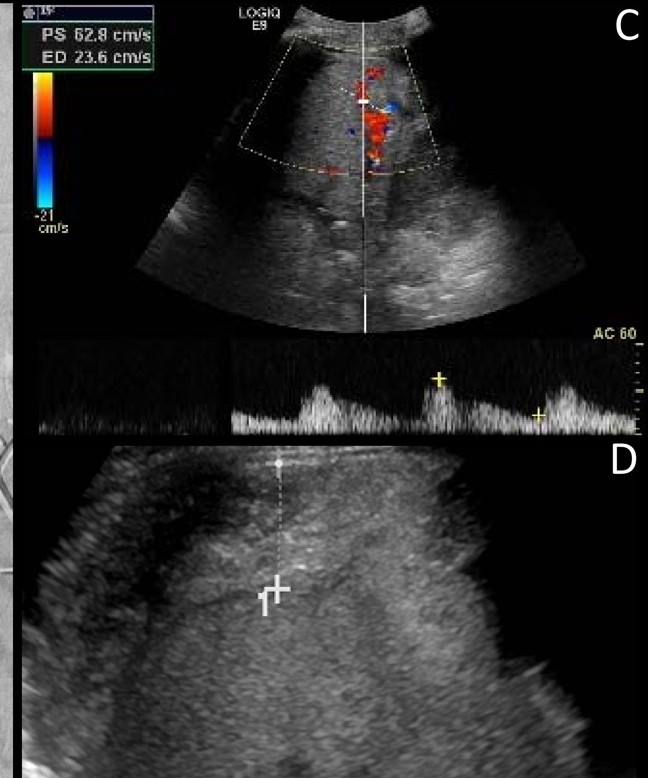
PROCEDURE

- Although antegrade recanalization was unsuccessful, the tip of the microcatheter was maintained in the SMV at the occluded anastomosis, serving as a target for sharp recanalization from the portal side
- Using the back-end of a guidewire, the occlusion was crossed retrogradely and the SMV was catheterized via the transhepatic route (figure A)
- This was followed by 8 mm balloon angioplasty and insertion of a 10 mm x 6 cm stent at the SMV-PV junction (figure B)
- Post-stenting venogram demonstrated multiple filling defects (arrows in C)
- Overnight local thrombolysis with t-PA was performed with a sheath in the liver and a catheter extending into the PV and SMV (arrow in figure D)
- Note the radio-opaque markers demonstrating the start and end of the perfusion segments (arrowheads in figure D)

POST-PROCEDURE



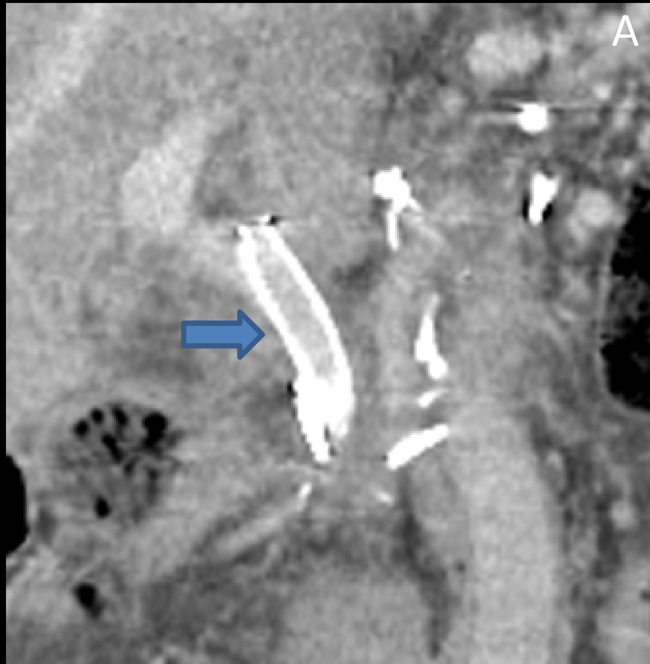


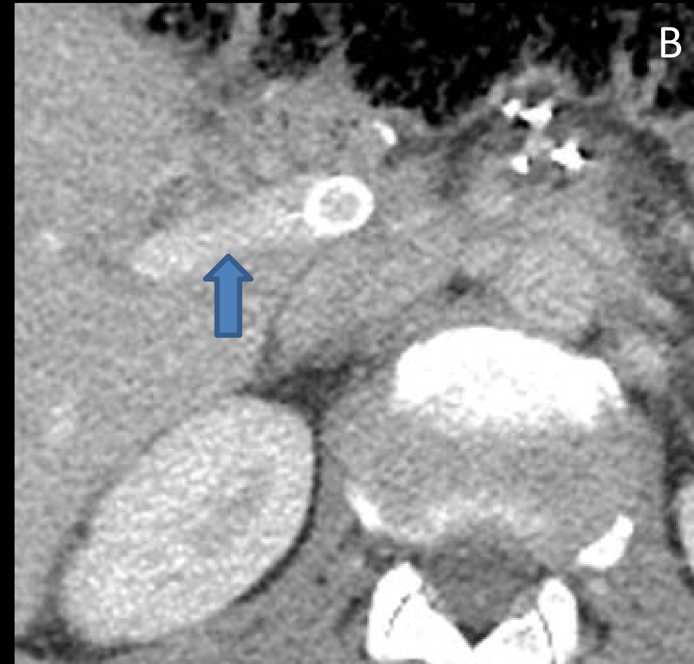


POST-PROCEDURE

- Direct portal venogram (A) the next day demonstrated patency of the PV, SMV and stent, with a small amount of residual thombus in the right and left PV branches
- The sheath and catheter were removed, but the tract could not be completely sealed with gelfoam
- A subsequent indirect portal venogram (B) showed an area of contrast extravasation arising from the parenchymal tract in segment 6 (arrow in B)
- This was confirmed by ultrasound (C), which also demonstrated adjacent hemoperitoneum (arrow in D)
- An 8 Fr multipurpose catheter was inserted to drain the hemoperitoneum
- After cessation of t-PA and 24 hr ICU monitoring, a repeat indirect portal venogram performed the next day demonstrated vessel patency without signs of active extravasation (not shown)

POST-PROCEDURE





POST-PROCEDURE

- Follow-up CT scan (coronal view, A, and axial view, B) subsequent to IV heparin therapy demonstrates patency of the stent (arrow, figure A) and portal vein (arrow, figure B)

DISCUSSION

- 9% rate of medium-term severe stenosis of PV/SMV anastomosis in patients undergoing pancreatectomy[1]
- 17% rate of portal vein thrombosis post-pancreatectomy[2]
- Patients with chronic PV/SMV anastomotic occlusion[1]:
  - Develop extrahepatic mesenteric venous hypertension
  - Gastrointestinal bleeding
  - Bleeding at site of choledochojejunostomy
- Portal vein thrombosis etiology[3]:
  - Impeded intrahepatic blood flow
  - Hypercoagulable states
  - Endothelial injury (intra-abdominal infection/inflammation, surgery)
- Chronic portal vein thrombosis present with[4, 5]:
  - Hematemesis (ruptured varices is most common presentation)
  - Increased abdominal girth or abdominal pain
  - Often asymptomatic

DISCUSSION

- Site directed thrombolysis, such as TPA, is an accepted treatment modality for acute portal vein thrombosis [3]
- Sharp recanalization technique is a useful tool in patients with a complete occlusion that cannot be traversed by guidewire[6]
- Requires vascular access upstream and downstream to the site of the occlusion[6]
- Allows controlled through-and-through access with low rate of complications[6]
- Several methods available[7]:
  - Back-end of a guidewire
  - Needle recanalization
  - Radiofrequency guidewire, which has been successful with low frequency of complications
- Potential complications:
  - Intraperitoneal hemorrhage
  - Injury to the adjacent SMA
  - Injury to adjacent organs such as liver, pancreas and bowel

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- 2. Smoot, R.L., J.D. Christein, and M.B. Farnell, *Durability of portal venous reconstruction following resection during pancreaticoduodenectomy.* J Gastrointest Surg, 2006. **10**(10): p. 1371-5.
- 3. Thomas, R.M. and S.A. Ahmad, *Management of acute post-operative portal venous thrombosis.* J Gastrointest Surg, 2010. **14**(3): p. 570-7.
- 4. Cohen, J., R.R. Edelman, and S. Chopra, *Portal vein thrombosis: a review.* Am J Med, 1992. **92**(2): p. 173-82.
- 5. Handa, P., M. Crowther, and J.D. Douketis, *Portal vein thrombosis: a clinician-oriented and practical review.* Clin Appl Thromb Hemost, 2014. **20**(5): p. 498-506.
- 6. Farrell, T., E.V. Lang, and W. Barnhart, *Sharp recanalization of central venous occlusions.* J Vasc Interv Radiol, 1999. **10**(2 Pt 1): p. 149-54.
- 7. Horikawa, M. and K.B. Quencer, *Central Venous Interventions.* Tech Vasc Interv Radiol, 2017. **20**(1): p. 48-57.