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Embolization of Arterial-Portal Fistula to Treat Associated Hemobilia after Transjugular Liver Biopsy

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A complication of transjugular liver biopsy is intrahepatic arterial injury resulting in arterial-biliary fistula and hemobilia. Imaging findings in patients with iatrogenic hemobilia are varied. While many cases can be managed conservatively, rapid or persistent bleeding may require intervention. Herein, we present a case of hemobilia after transjugular liver biopsy where an associated iatrogenic arterial-portal fistula was the only imaging finding visualized. The authors further provide an overview of the risks associated with transjugular liver biopsy, typical imaging findings, and management options.

Case Presentation

A 54-year-old man with history of diabetes, hypertension, cerebrovascular accident, coronary artery disease status post stent placement, and end-stage renal disease on hemodialysis was found to have chronic hepatitis B infection and possible cirrhosis on workup for renal transplant. He was referred for transjugular liver biopsy with portal pressure measurements for further characterization of liver disease. The patient was on long-term dual-antiplatelet therapy with aspirin 81 mg and clopidogrel (Plavix, Bristol-Myers Squibb, New York, NY) 75 mg by mouth daily. Clopidogrel was held 5 days before the procedure. His preprocedural laboratory values 10 days before the procedure were hemoglobin 11.7 g/dL, hematocrit 35.2%, platelets 91×10^9/L, and international normalized ratio (INR) 1.2.

A 10-Fr sheath was introduced via the right internal jugular vein for the transjugular biopsy. Mean right atrial and inferior vena cava pressures measured 6 and 7 mm Hg, respectively. Mean free and wedged right hepatic venous pressures obtained through a balloon occlusion catheter measured 8 and 20 mm Hg, respectively. Three 19-gauge core biopsies were taken via the right hepatic vein (►**Fig. 1**) using Cook Medical Liver Access and Biopsy Needle Set (Cook Medical Inc., Bloomington, IN) with guiding cannula rotated anteriorly. The patient tolerated the procedure well without evidence of immediate complication. Laboratory values immediately postprocedure were as follows: hemoglobin, 10.0 g/dL; hematocrit, 29.8%; and platelets, 65×10^9/L. The hemoglobin 3 hours postprocedure was 10.2 g/dL. The patient's vital signs remained within normal limits and stable throughout their postprocedural observation. He was discharged home 4 hours postprocedure. The patient was instructed to restart clopidogrel 3 days after the procedure. Pathology for the biopsy returned stage 4 cirrhosis (scale 0–4, Batts–Ludwig methodology).

Four days following the procedure, the patient presented to an outside emergency department with severe, acute-onset, right upper quadrant abdominal pain and nausea. He was found to have cholelithiasis on limited abdominal ultrasound with an elevated total bilirubin and alkaline phosphatase. The patient was transferred to our institution for further management and workup of possible choledocholithiasis. Overnight the patient's right upper quadrant pain decreased. Computed tomography (CT) of the abdomen and pelvis and repeat right upper quadrant ultrasound demonstrated cholelithiasis without evidence of cholecystitis or choledocholithiasis.

During this time period, the patient began to have bright red blood per rectum. His hemoglobin dropped to 6.8 mg/dL and 1 unit of packed red blood cells was administered. Upper and lower endoscopy procedures were performed demonstrating active bleeding from the ampulla/papilla consistent with hemobilia. CT angiography of the abdomen and pelvis demonstrated contrast opacification of a right portal vein branch on arterial phase images. However, contrast increased in the common bile duct and duodenum on delayed phase imaging (►**Fig. 2**).

Interventional radiology was consulted for angiography and potential embolization. On hepatic arteriography, an

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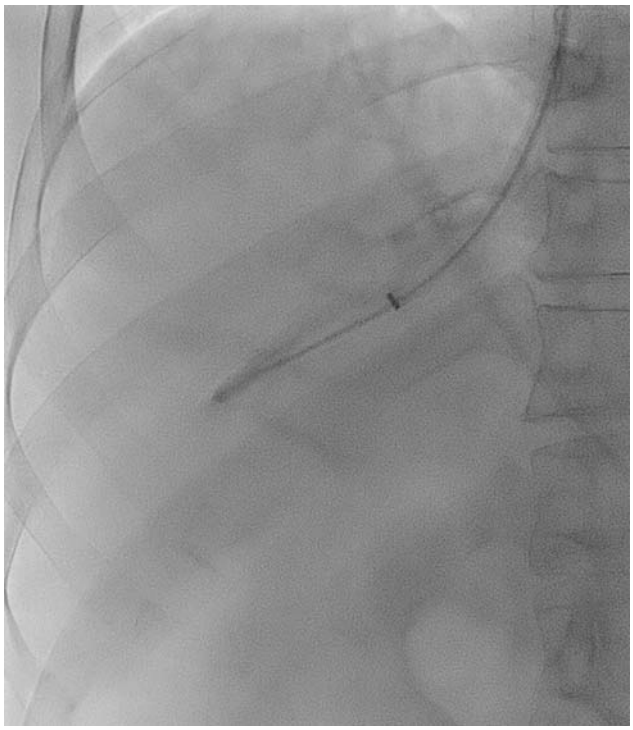

Fig. 1 Transjugular liver biopsy. Fluoroscopic image demonstrates sheath and catheter in right hepatic vein.

Fig. 3 Right hepatic arteriography demonstrates filling of both the artery (arrow) and portal vein during arterial phase injection (arrowhead), signifying arterioportal fistula of segment 6 branch.

arterioportal fistula was identified arising from the posterior branch of the right hepatic artery (►**Fig. 3**). No arteriocholedochal fistula or pseudoaneurysm was identified, and therefore embolization was not performed. However, the patient continued to have hematochezia and decreasing hemoglobin requiring blood transfusion over the next 3 days. He was brought to interventional radiology for repeat angiography. Again, an arterioportal fistula was identified arising from the posterior branch of the right hepatic artery and no arteriobiliary fistula or pseudoaneurysm was identified. Embolization was performed using two 2 mm × 6 cm coils (Concerto; Medtronic, Irvine, CA) followed by absorbable gelatin sponge (Surgifoam; Ethicon Inc, Somerville, NJ) to stasis of the segment 6 right hepatic artery branch supplying the arterioportal fistula (►**Fig. 4**). His hemoglobin remained stable thereafter with small amount of melena attributed to old blood. Three days after embolization, he was discharged home on aspirin and clopidogrel. The patient was seen for follow-up 1 week later without report of abdominal pain or hematochezia. He has remained asymptomatic 10 months following the embolization.

Discussion

Transjugular liver biopsy is a common procedure with a high technical success rate and complication rate of approximately 1 to 7%.[1–4] The major complication rate is approximately 0.5%.[2,4] The most commonly reported major complication for transjugular liver biopsy is hemorrhage in the form of intraperitoneal hemorrhage, subcapsular liver hematoma, or

Fig. 2 Multiphase CT of the abdomen and pelvis of a 54-year-old man with known hemobilia discovered on endoscopy. (**a**) Noncontrast CT does not demonstrate hyperdensity within right hepatic lobe which would have suggested postprocedural hematoma. (**b**) Arterial phase demonstrates visualization of contrast in the right posterior portal vein (arrow). (**c and d**) Delayed phase demonstrates pooling of contrast in the common bile duct and duodenum (arrow).

Fig. 4 Repeat hepatic arteriography with super selective catheterization demonstrates persistent arterioportal fistula (**a**) and resolution postembolization (**b**).

hemobilia.[1,2,5] Risks of major hemorrhage from transjugular liver biopsy can be technical or patient related. Liver puncture complications have been shown to be lower with smaller needle diameter and at high volume centers.[2] The number of needle passes and frequency of correlated complications is debatable with studies demonstrating mixed results.[6,7] Type of needle has also been demonstrated mixed results.[2,8,9] The most consistent patient-related factor is small livers, particularly in children, who are at up to six times increased risk of capsular perforation.[2] Increased INR or decreased platelet count have not been associated with increased complication rate.[10,11] To our knowledge, the risk factors for hemobilia specific to transjugular liver biopsy have not been determined.

Hemobilia has been reported as a complication from a variety of transhepatic procedures including percutaneous liver biopsy, transjugular liver biopsy, radiofrequency ablation, and percutaneous transhepatic biliary drainage (PTBD).[12–16] The imaging findings can include active extravasation into the peritoneum, pseudoaneurysm, arteriobiliary fistula, or arterioportal fistula. A study on CT imaging findings in 30 patients with iatrogenic hemobilia demonstrated pseudoaneurysm was the most common finding (22/30), and an arteriobiliary fistula was seen in only 3 patients (3/30).[12] Arterial-portal fistula was not described as an isolated finding. In a study of 3,780 PTBDs with 72 hepatic artery injuries, 32 demonstrated an arteriobiliary fistula (45%) and 30 demonstrated pseudoaneurysm (42%), with arteriocholedochal fistula more likely to present early (<1 week) and pseudoaneurysm more commonly late (>1 week).[15] Additionally, a study of 930 PTBDs with 30 hepatic artery injuries on angiographic imaging findings included active contrast material extravasation (13, 43%), pseudoaneurysm (13, 43%), arteriobiliary fistula (10, 33%), and arterioportal fistulas (3, 10%).[16] While the imaging features associated with hemobilia after hepatic procedures varies, the lower reported rate of detected arterioportal fistulas is possibly because they are likely to self-resolve.[17]

In case of clinically significant hemobilia, transarterial embolization can be safely performed.[15,16,18,19] In the case of arterioportal fistulas with multiple feeding arterial vessels or central location, proximal hepatic artery coil embolization alone may fail to durably occlude fistula in which case more extensive treatment may be required with distal coil embolization or transvenous obliteration.[20,21] However, proximal coiling has been shown to be effective in selective cases.[19,22] Minor complications, including hepatic ischemia, focal hepatic infarct, and elevation of liver enzymes, are common posttransarterial coil embolization.[15] The risk of major complications is mitigated by the dual blood supply from the portal venous system, but biliary ischemia may occur as the hepatic artery may predominantly supply the biliary tree, particularly in liver transplant patients.[22]

In summary, the case presented demonstrates a combination of hemobilia posttransjugular liver biopsy characterized by an arterial-portal shunt as the only imaging finding on angiography, treated successfully with transarterial coil embolization. Iatrogenic hemobilia, a rare complication of posttransjugular liver biopsy, has a variety of imaging findings. An arterial-portal fistula as an isolated angiographic finding without pseudoaneurysm or discernible arteriobiliary fistula does likely identify the location of injury since the bile duct lies in the portal triad adjacent to the hepatic artery and portal vein. Some cases can be managed conservatively; however, uncontrolled bleeding requires intervention which can be performed with transarterial coil embolization.

Conflict of Interest

M.P.K. has received consulting fees from Medtronic, Boston Scientific, and Penumbra.

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