Angioembolization of Post-traumatic Intrahepatic Arterioportal Fistula Presenting With Portal Hypertension

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Traumatic hepatic arterioportal fistula is an abnormal communication between the hepatic artery and portal vein and is a rare cause of non-cirrhotic portal hypertension with delayed presentation, usually after a remote history of abdominal trauma or an interventional procedure. This case report is of one such rare presentation, wherein a 59-year-old gentleman presented with unexplained ascites and complications of portal hypertension, eventually diagnosed with an arterioportal fistula on a computed tomography scan and managed by angioembolization. There was a remarkable improvement in the complications of portal hypertension after the coil embolization. (J CLIN EXP HEPATOL 2019;9:541–545)

A 59-year-old gentleman was referred to our liver and biliary institute with a diagnosis of decompensated chronic liver disease for liver transplantation, after an initial workup at an outside hospital for hematemesis and unexplained ascites over 6 months.

The patient had undergone an esophageal variceal ligation at the outside hospital, and the sonogram performed there revealed diffuse liver disease with portal hypertension in the form of dilated portal vein, mild splenomegaly, and moderate ascites.

The patient had no history of chronic ethanol intake, diabetes, hypertension, cardiovascular disease, indigenous medications, past major surgeries, or blood transfusions. The hepatitis serology and autoimmune and metabolic markers were also negative during the diagnostic workup to identify the etiology of chronic liver disease.

As the underlying etiology could not be ascertained, a diagnosis of cryptogenic chronic liver disease was made at this time, with an hepatic venous pressure gradient (HVPG) of 10 mm Hg, model for end-stage liver disease (MELD) score of 18 points, and Child-Turcotte-Pugh (CTP) score of 9 points.

However, the subsequent pretransplant workup computed tomography (CT) scan revealed an unexpected finding which changed the patient's clinical management.

The CT scan demonstrated aneurysmal dilatation of the intrahepatic portal vein branches with a fistula between the right hepatic artery and anterior branch of the right portal vein. The liver surface was smooth with atrophy of the right hepatic lobe (secondary to the arterioportal shunting) and compensatory hypertrophy of the left hepatic lobe. Additional findings of pruning of the segmental portal vein branches, splenomegaly, portosystemic collaterals, moderate ascites, and pleural effusion were also noted [Figures 1 and 2].

The CT scan findings helped us in attributing the entire disease process to the arterioportal shunt causing portal hypertension. The relatively high HVPG (10 mm Hg) in this case of presinusoidal portal hypertension is likely related to the right hepatic lobe parenchymal changes and atrophy, secondary to the fistula and shunting.

After this CT revelation and on further probing, the patient was able to recall a motor vehicle accident which he had sustained about 20 years ago, causing the right upper abdominal trauma and requiring hospitalization. This history of remote trauma to the right upper abdomen appears to be the likely cause of the arterioportal fistula.

A decision was taken to embolize the arterioportal shunt, anticipating the resolution of the complications of portal hypertension, with the option of liver transplantation if the embolization was unsuccessful.

The hepatic angiogram revealed a 6-mm fistula between the anterior segmental branch of the right hepatic artery and anterior branch of the right portal vein with rapid and early contrast opacification of the aneurysmally dilated right portal vein (Figure 3). Superselective catheterization with a microcatheter (Progreat, Terumo Tokyo, Japan) was performed, and the hepatic arterial branch feeding the fistula was successfully embolized with seven pushable 0.018" microcoils (One 8 mm × 14 cm; four

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Abbreviations: CT: computed tomography; CTP: Child-Turcotte-Pugh; HVPG: hepatic venous pressure gradient; MELD: model for end-stage liver disease; MR: magnetic resonance; n-BCA: n-butyl-2-cyanoacrylate

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Figure 1 CT arterial phase images, (A, axial); (B, coronal); and (C, sagittal), demonstrate the right hepatic artery (red arrow) leading to the arterioportal fistula (black arrow) with an early and rapid opacification of the aneurysmally dilated right branch of the portal vein (blue arrow). CT, computed tomography.

Figure 2 CT arterial phase MIP, maximum intensity projection images, (A and C, coronal) and (B and D, axial), demonstrate the right hepatic artery (red arrow), the arterioportal fistula (black arrow), and the dilated right branch of portal vein (blue arrow). CT, computed tomography.

10 mm × 14 cm; and two 12 mm × 14 cm; MicroNester-Cook Medical, Bloomington, Ind.) [Figure 4].

The first 8 mm × 14 cm coil deployed at the level of the fistula migrated into the dilated right branch of the portal vein. This venous side migration was likely related to the high flow across the arteriovenous fistula and inappropriate size of the coil (even though sized about 30% more than the size of the fistula). However, the migrated coil was confined in the right branch of the portal vein, without any immediate complications.

Subsequently, 10 mm × 14 cm and 12 mm × 14 cm coils were deployed, and the feeding artery was tightly packed until the arterioportal fistula was completely occluded. No other procedural or postprocedural complications were noted on follow-up.

After the coil embolization, the patient was followed up on an outpatient basis for the resolution of ascites and hydrothorax. During the course of follow-up, the patient's symptoms of abdominal distension and dyspnea were resolved with no further episodes of hematemesis or melena.

The CT scan performed 3 months after the embolization revealed tightly packed coils completely obliterating the arterioportal fistula with minimal ascites and pleural effusion. The aneurysmally dilated right branch of the portal vein had decreased in size with no arterial phase contrast opacification. There was no portal vein thrombosis, secondary to the coil migration. Furthermore, the previously observed periesophageal, perigastric, perisplenic portosystemic collaterals had also resolved [Figure 5].

Figure 3 Selective right hepatic angiogram (A) reveals the abnormal high-flow fistula (black arrow) between the right hepatic artery (red arrow) and the aneurysmally dilated right branch of the portal vein (blue arrow) which shows the early and rapid opacification in the arterial phase (B, C, and D).

Figure 4 Supraselective catheterization of the right hepatic artery branch (A) feeding the arterioportal fistula (black arrow). (B) Coil embolization of the fistula and feeding artery with multiple microcoils (green arrow). One migrated coil in the right branch of the portal vein (yellow arrow). Postembolization hepatic angiogram reveals the complete occlusion of the arterioportal fistula with no opacification of the intrahepatic portal vein branches in the early and delayed arterial phases (C and D). Right hepatic artery (red arrow).

Figure 5 CT arterial phase (A and C) and portal venous phase (B and D) images demonstrate densely packed coils (green arrow) causing metallic streak artifacts in the region of the previously noted arteriportal fistula with no early opacification or dilatation of the portal vein branches. No portal vein thrombosis identified. CT, computed tomography.

The HVPg, MELD, and CTP score, 3 months after embolization, had improved to 5 mm Hg, 10 points, and 6 points respectively.

In view of the remarkable improvement in the clinical symptoms and CT study findings of portal hypertension after embolization of arteriportal fistula, liver transplantation was deferred, and the patient was managed conservatively. After 2 years of regular outpatient follow-up and clinical evaluation after coil embolization, the patient has been asymptomatic with complete resolution of the complications of portal hypertension.

DISCUSSION

Acquired hepatic arteriportal fistula represents an abnormal communication between the hepatic artery and portal vein leading to presinusoidal portal hypertension,¹ the most common etiology being abdominal trauma, followed by iatrogenic procedures (surgery, biopsy, percutaneous biliary interventions, and tumor ablations), malignancy, and rarely secondary to the rupture of hepatic artery aneurysm.^{1,2} The patients may present with features of portal hypertension such as gastrointestinal bleeding and ascites or with heart failure or diarrhea (due to congestive vascular enteropathy).²

Persistent high-flow arteriportal fistulas causing portal hypertension after trauma or interventions are relatively

rare as the majority of acquired arteriportal fistulae resolve spontaneously as they are small with the low shunt volume.^{3,4}

Arteriportal fistulae can have either an acute or delayed presentation. In our patient with a remote history of upper abdominal trauma, we presume that liver injury was the cause of a persistent high-flow arteriportal fistula and the subsequent development of portal hypertension with delayed presentation. Portal hypertension from arteriportal fistula is potentially curable unlike portal hypertension associated with cirrhosis. Symptomatic arteriportal fistulae require urgent endovascular intervention.⁵

Ultrasonography/Doppler in a case of arteriportal fistula causing portal hypertension can demonstrate a dilated portal vein with arterial waveforms and hepatofugal flow. CT/magnetic resonance (MR) angiography can establish the diagnosis of the fistula with an early and prolonged contrast opacification of the dilated portal vein in the arterial phase of the study, in addition to the visualization of the fistula itself between the hepatic artery and the portal vein. Catheter angiography confirms the diagnosis with the pathognomonic finding of immediate visualization of the portal vein on hepatic arteriogram.^{6,7}

Endovascular interventional radiological management is considered the first line and definitive treatment wherever feasible before considering surgical interventions. Coil embolization is the preferred endovascular treatment

in arterioportal fistulas, and n-butyl-2-cyanoacrylate (n-BCA, Glue) can be used as an option if the initial coil embolization fails; however, n-BCA is associated with a high risk of distal embolization.^{2,7-9}

Complications that may occur with embolization are coil migration, vascular injury, hepatic failure, abscess, portal vein thrombosis, and bile duct stricture.^{1,9} In our patient, we could successfully embolize the fistula with multiple coils. However, one of the coils migrated into the venous side and was confined in the right branch of the portal vein; fortunately, there was no portal vein thrombosis on follow-up imaging.

CONCLUSION

Arterioportal fistula, although a rare entity, should be considered as a possible etiology of portal hypertension in patients without overt cirrhosis, and the past history for liver interventions or upper abdominal trauma should be elicited.

The arterioportal fistula can be identified on ultrasonography/Doppler and confirmed on CT/MR/catheter angiography. Effective and timely endovascular intervention can reverse the portal hypertension secondary to arterioportal fistula and prevent the progression of the liver parenchymal disease.

Angioembolization of the fistula through the hepatic artery is considered as a safe and effective first-line treatment as it has decreased morbidity/mortality, complications, and recovery time.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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