

Spontaneous resolution of an iatrogenic arterioportal fistula following portal-vein thrombosis

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A 64-year-old male underwent a liver biopsy based on clinical concern for primary biliary cirrhosis. The biopsy, which yielded normal results, was uneventful, with no immediate postbiopsy complications. A later MRI demonstrated early opacification of the right portal vein on arterial-phase imaging, suggesting communication between the right hepatic artery and the right portal vein. A conservative, watchful management approach was taken. Followup imaging demonstrated a thrombus within the main portal vein, with resulting decreased flow through the fistula. Further followup demonstrated complete occlusion of the main portal vein, with cavernous transformation. The fistula at this time had completely resolved. This is an example of spontaneous resolution of an arterioportal shunt secondary to a portal-vein thrombosis. Whether the portal-vein thrombosis was caused by altered flow dynamics within the main portal vein or an unrelated disorder is not certain. The patient had a prior history of deep venous thrombosis, but workup for a hypercoagulable state was negative.

Case report

A 64-year-old male presented to his gastroenterologist with a history of portal hypertension and esophageal varices. His past medical history was remarkable for an episode of deep venous thrombosis. He also had a history of ulcerative colitis for which a colectomy and ileostomy had been performed. The patient had no history of hepatitis B or C, nor did he report any alcohol abuse.

Based on clinical concern for primary biliary cirrhosis, a percutaneous liver biopsy was performed. The patient tolerated the biopsy well and was discharged without any ob-

vious immediate postbiopsy complications. The results of the biopsy were essentially unremarkable, revealing no evidence of either fibrosis or cirrhosis.

Following the biopsy, an MRI of the liver demonstrated a new geographic focus of increased T2 signal in the region of the biopsy (Fig. 1A). This region demonstrated decreased signal on both in- and opposed-phase imaging (Figs. 1B, 1C). However, no difference in signal was seen between these two T1-gradient sequences.

T1, fat-saturated, 3D-gradient, arterial-phase imaging demonstrated contrast opacification of the anterior branch of the right portal vein at the same time as the right hepatic artery (Figs. 2A, 2B). During this phase however, there was no main portal-vein enhancement. The main and left portal veins did opacify as expected in the portal phase of imaging (Figs. 2C, 2D). These findings suggested an iatrogenic fistulous communication between the right hepatic artery and the anterior branch of the right portal vein.

No intervention was performed as this time, but rather a watchful management approach was taken. One month later, a triple-phase CT demonstrated a nonenhancing filling defect with the right portal vein, with extension into adjacent portions of the anterior and posterior branches (not shown). A subsequent MRI demonstrated complete occlusion of the main portal vein, with cavernous transformation. The prominent early filling of the anterior branch of the right portal vein seen on the previous MRI

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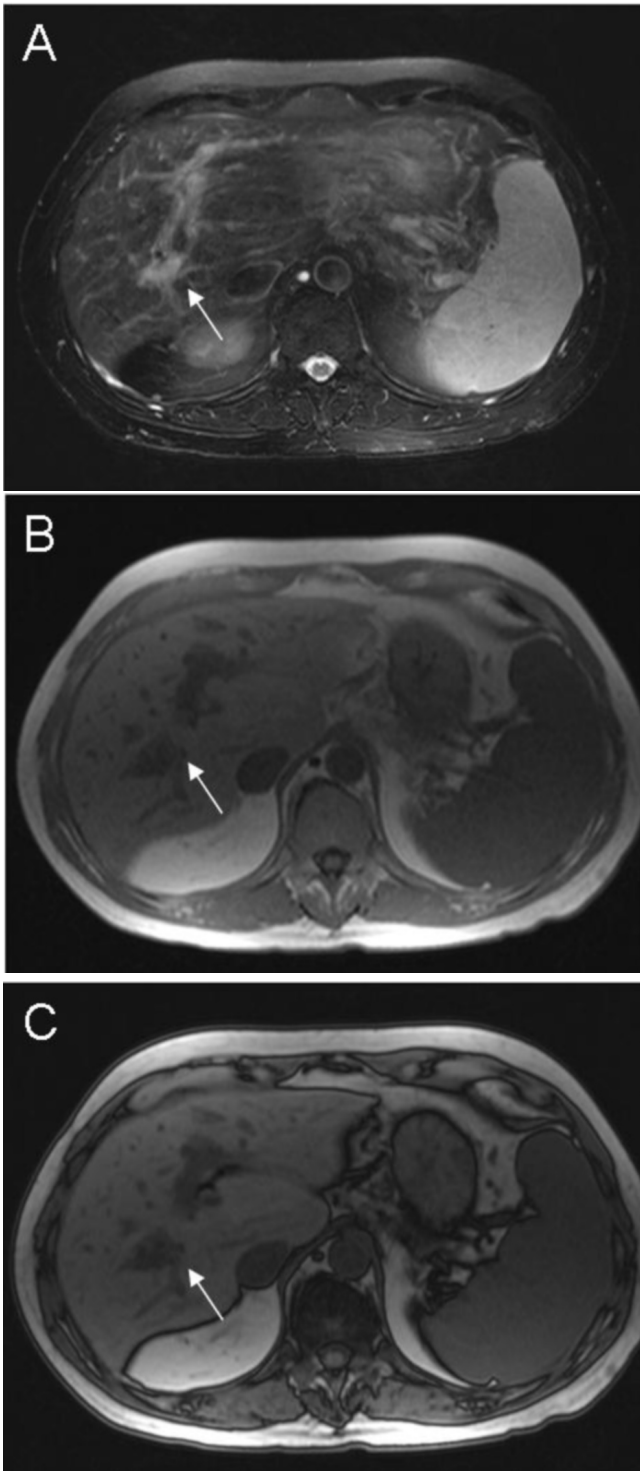


Figure 1. 64-year-old male with iatrogenic arterioportal fistula. T2-weighted, fat-saturated image (A) demonstrates increased T2 signal (white arrow) within the posterior right lobe of the liver. This region demonstrates decreased signal on in-phase (B) and opposed-phase (C) imaging. No change in signal was noted between in- or opposed-phase imaging.

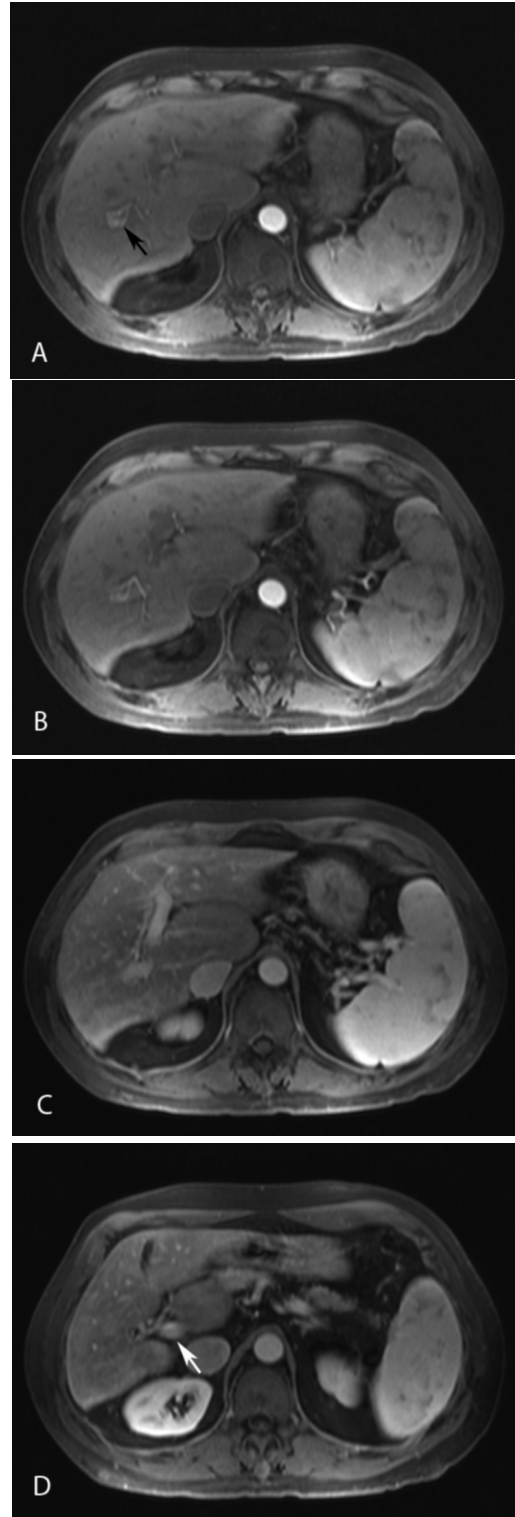


Figure 2. 64-year-old male with iatrogenic arterioportal fistula. Axial postcontrast THRIVE sequences. Arterial phase imaging (A, B) demonstrates opacification of the posterior branch of the right portal vein (black arrow). Portal-venous imaging (C, D) demonstrates good opacification of the main (white arrow) and left portal veins.

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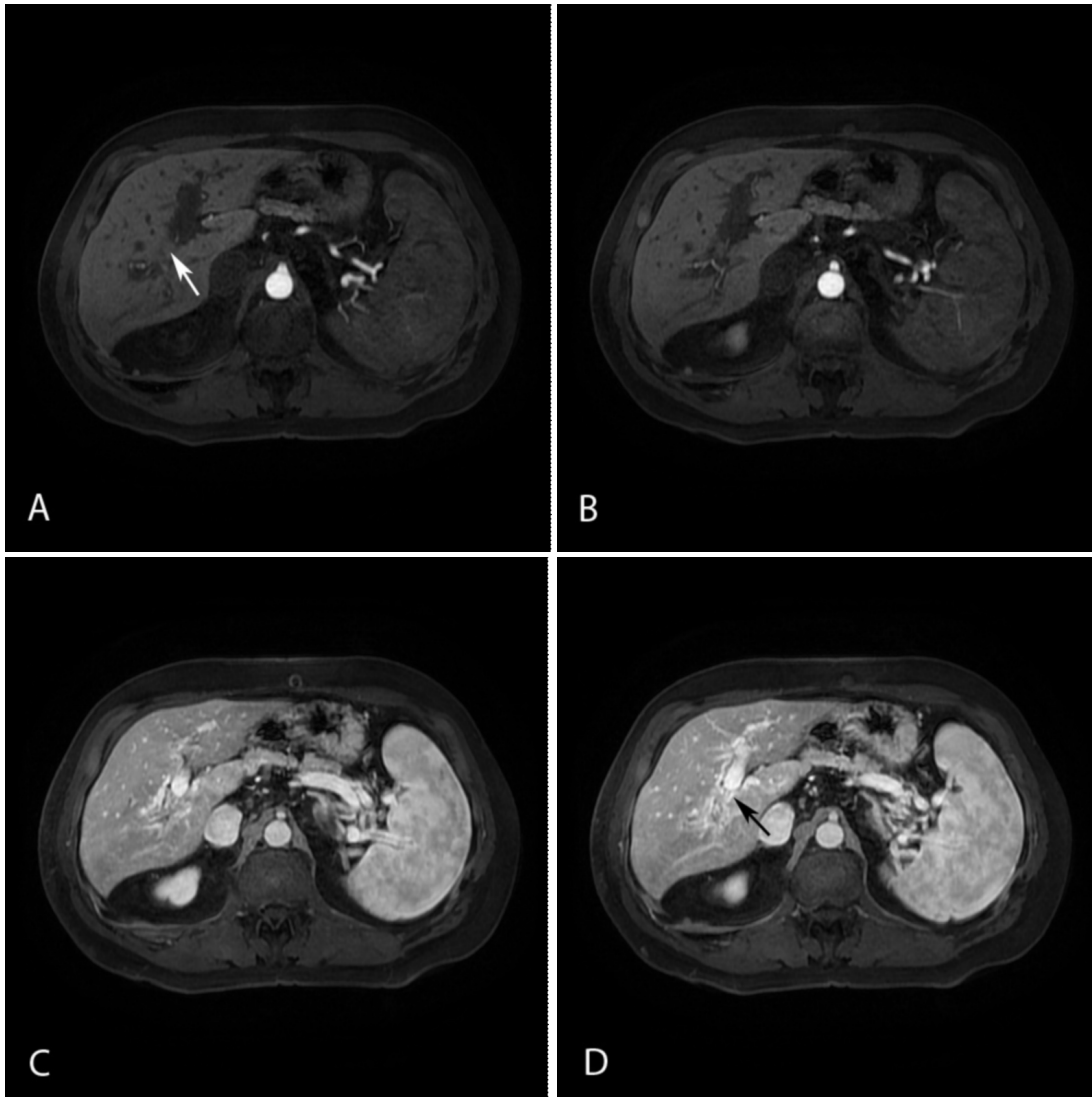


Figure 3. 64-year-old male with iatrogenic arteriportal fistula. Axial post-contrast THRIVE sequences. Arterial phase imaging (A, B) demonstrates opacification of the right hepatic artery without filling of the posterior branch of the right portal vein (white arrow). Portal-venous imaging (C, D) demonstrates multiple collaterals without a clearly identifiable main portal vein (black arrow).

examination was no longer present, indicating that the arteriportal fistula had resolved.

The hepatic veins were patent and showed no evidence of thrombus, but there were an increased number of small veins around the anterior branch of the right portal vein, indicating the development of collateral venous flow. As in the previous MRI, prominent esophageal varices were seen in the distal esophagus. As a result, elective endoscopic band ligation was performed for treatment. The patient was also referred for a hematologic evaluation and anticoagulation treatment, but the hematological workup was surprisingly negative for hypercoagulable states.

Discussion

Transcutaneous liver biopsy is a regularly performed procedure and is the gold standard in evaluating liver histology. However, the procedure does not come without its risks, one being arteriportal fistula formation. Okuda *et al.* (1) have reported an AP fistula rate of 5.4% in 93 patients who underwent hepatic angiography after an earlier percu-

taneous liver biopsy (PLB). In Okuda's study, the length of time between PLB and angiography ranged from three days to four weeks. A more recent study performed by Lee *et al.* (2) reported an AP fistula rate of 38% in 21 patients who underwent hepatic angiography and CT confirmation imaging shortly after biopsy. These tests were performed (on average) 5.5 days after biopsy, with a maximum delay period of 11 days. The discrepancy in rate between Okuda and Lee may be due to differences in the time interval between biopsy and when the patient was examined for fistula formation. In addition, Lee used both angiography and CT to confirm the presence of the arteriportal communication. Furthermore, a study by Hellkant (3) demonstrated the presence of arteriportal fistulas in 52% of patients who had an arteriogram performed within one week following liver biopsy. Surprisingly, this rate decreased to only 10% if the arteriogram was performed three weeks after the procedure, suggesting that most small, peripheral, asymptomatic fistulas caused by liver biopsy resolve spontaneously over time.

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With respect to this patient, it is felt that the right-portal-vein thrombus resulted in decreased flow through the fistula, since the outflow pathway was obstructed. During the course of these studies, the patient's liver function remained stable. It is possible that were it to have declined, increased portal hypertension might also have resulted in altered flow dynamics, allowing the fistula to close. The patient's workup for hypercoagulability was negative and, although it is unlikely, it is possible that a clot formed at the site of the iatrogenic fistula independent of the portal-vein thrombus.

The decision as to whether to treat arterioportal fistulas is divided in the literature. Variables that affect this decision include location of the fistula (intrahepatic vs. extrahepatic), the condition of the patient, the size of the fistula, and the presence of symptoms (4). While many fistulas, especially if small, do resolve on their own over time, it is important to consider the consequences of portal hypertension and subsequent formation of varices in individuals with larger fistulas. Portal hypertension can have grave consequences for the patient, and it is important not to overlook this matter.

In general, surgery is the procedure of choice for treatment of extrahepatic fistulas, while transarterial embolization is usually reserved for intrahepatic fistulas (5). Embolization has proven to be useful for patients with conditions or circumstances that do not allow for surgical treatment. Two of the most commonly used embolic materials have been Gelfoam and steel coil. Intra-arterially delivered ethanol embolization for arterioportal shunts in hepatocellular carcinoma (HCC) patients has also been experimented with, as well as polyvinyl alcohol embolization (6). In addition, radiotherapy has also been proposed in patients with HCC. In a study by Hsu, H. C. *et al* (7), the experimenters showed that 5/20 patients received benefits from complete or partial occlusion of their arterioportal shunts via radiotherapy.

The decision to treat arterioportal fistulas is not an easy one. The benefits and risks of not anticoagulating the patient must carefully be evaluated, especially in a case such as the one presented in this report. In the end, due to improvements in flow through the hepatic portal vein and spontaneous closure of the fistula, it was decided to hold off on long-term treatment with anticoagulants.

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