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CASE REPORT

Arteriovenous malformation of the gallbladder: CT and angiographic findings

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Abstract We encountered a case of arteriovenous malformation (AVM) of the gallbladder in a patient with hepatocellular carcinoma (HCC). Contrast-enhanced computed tomography (CT) showed serpentine vessels around and within the gallbladder wall. Angiography showed dilated and tortuous cystic arteries, a racemose vascular network, and early-filling cystic veins. Transcatheter arterial embolization of two cystic arteries feeding the AVM was performed with platinum microcoils prior to transcatheter arterial chemoembolization for HCC to prevent embolic particles from flowing into these arteries. Follow-up contrast-enhanced CT showed blood flow in the gallbladder AVM, which appeared to be fed by the arterial collaterals.

Key words Gallbladder · Arteriovenous malformation · CT · Angiography

Introduction

Gallbladder arteriovenous malformation (AVM) is a rare entity, with only one case having been reported in the literature.[1] We encountered an AVM of the gallbladder in a patient with hepatocellular carcinoma (HCC). Transcatheter arterial embolization of the AVM was performed with platinum microcoils prior to transcatheter arterial chemoembolization (TACE) for the HCC. This report describes the computed tomographic (CT) and angiographic appearance of the gallbladder AVM.

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Case report

A 78-year-old woman was referred to our hospital for evaluation of a hepatic tumor detected by ultrasonography. On admission, laboratory examinations revealed liver function abnormality, positive hepatitis C virus antibody, and elevated α-fetoprotein level (38.7 ng/ml; normal < 6.1 ng/ml).

Dynamic CT showed a round, 4-cm diameter, enhanced tumor with a fibrous capsule in segment IV of the liver, which was suggestive of HCC. In addition to these findings, dilated vascular structures were noted around and within the gallbladder wall (Fig. 1). Arterial phase CT showed focal enhancement in segments IV and V of the liver surrounding the gallbladder, but the relation between the cystic vein and intrahepatic portal vein branch was unclear.

Abdominal digital subtraction angiography (DSA) was performed to treat the liver tumor with TACE. On celiac angiography, the large tumor in segment IV was seen to be supplied by branches of the left and right hepatic arteries, and several associated lesions were observed in both hepatic lobes. In addition, celiac angiography revealed a dilated and tortuous vascular lesion fed by two cystic arteries branching from the right hepatic artery (Fig. 2A) and an early-filling cystic vein (Fig. 2B). The lesion was therefore diagnosed as AVM.

Embolization of the two cystic arteries was performed with 0.018-inch platinum microcoils prior to TACE to

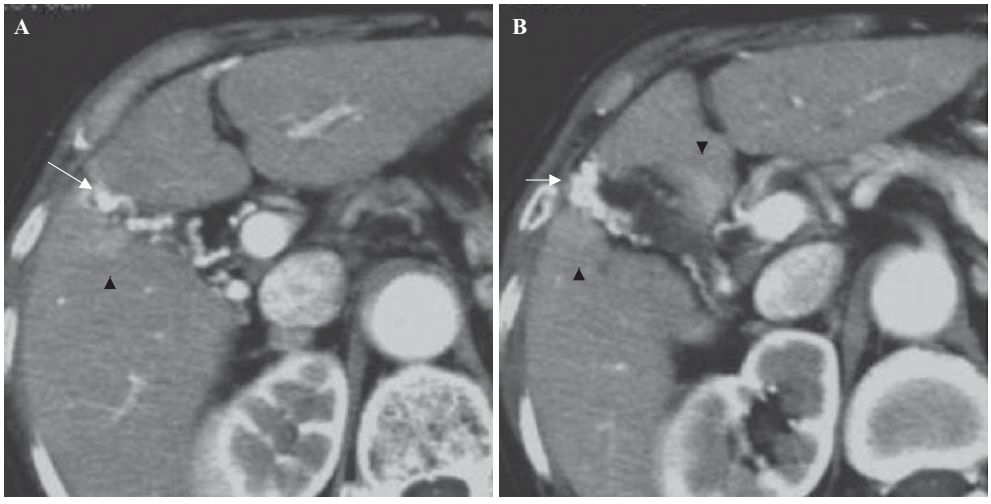

Fig. 1. **A**, **B** Contrast-enhanced computed tomography (CT) shows serpentine vessels around and within the gallbladder wall (*arrows*). Focal enhancement surrounding the gallbladder is also observed (*arrowheads*)

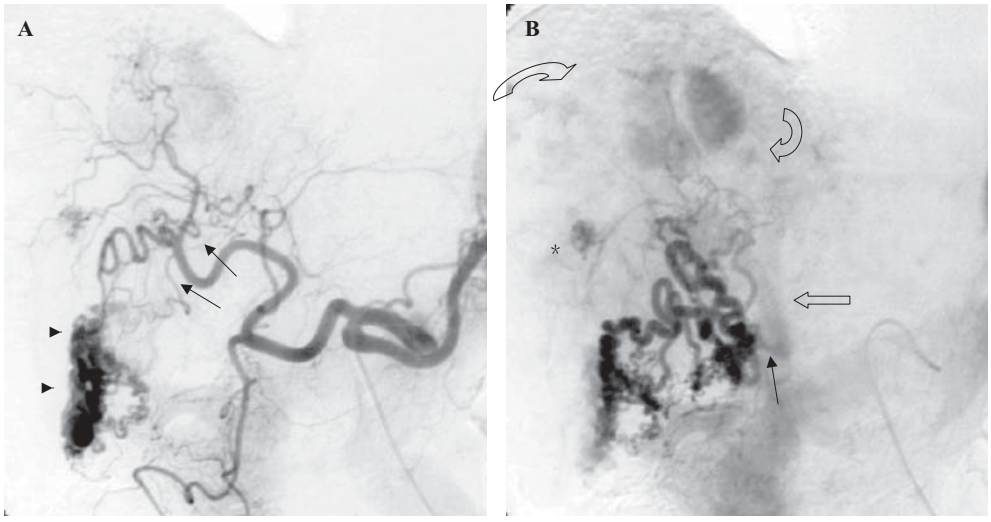

Fig. 2. **A** Celiac digital subtraction angiography demonstrates an arteriovenous malformation (AVM) (*arrowheads*) fed by two dilated cystic arteries (*arrows*). **B** Midarterial phase reveals early filling of the cystic vein (*arrow*), which drains into the portal vein trunk (*white arrow*). A large hepatocellular carcinoma (HCC) and suspected small HCCs are also evident (*curved arrows*). *Asterisk* indicates a hemangioma

the proper hepatic artery, preventing embolic particles for the HCC from embolizing the portal veins through the arteriovenous shunt and peripheral cystic arteries.

After ascertaining the disappearance of the AVM and early filling of the portal vein on proper hepatic angiography, TACE was performed to the proper hepatic artery using an emulsion of 20 mg doxorubicin hydrochloride (Adriamycin; Adria Laboratories, Dublin, OH, USA) mixed with 4 ml of iodized oil (Lipiodol Ultra-Fluid; Guerbet, Paris, France) and gelatin sponge particles (Gelfoam; Upjohn, Kalamazoo, MI, USA).

The clinical course after TACE was uneventful. Subsequently, the patient underwent percutaneous ethanol injection therapy. Follow-up CT demonstrated that blood flow in the gallbladder AVM was maintained (Fig. 3). The HCC recurred 4 years after discharge, but she did not return to our hospital.

Discussion

Arteriovenous malformations of the digestive organs are rare. Among them, gallbladder AVM is the most uncommon, having first been reported in 1997 by Tajima et al.[1] as an incidental finding on abdominal angiography performed for HCC. To our knowledge, the current case represents only the second reported case of gallbladder AVM.

Potential complications of gallbladder AVM include hemobilia or hemoperitoneum due to AVM rupture and esophagogastric bleeding from varices caused by increased portal hypertension. However, the two cases reported (including the present one) were asymptomatic and exhibited no mucocutaneous stigmata of Osler-Weber-Rendu disease, which occasionally includes gastrointestinal AVM.

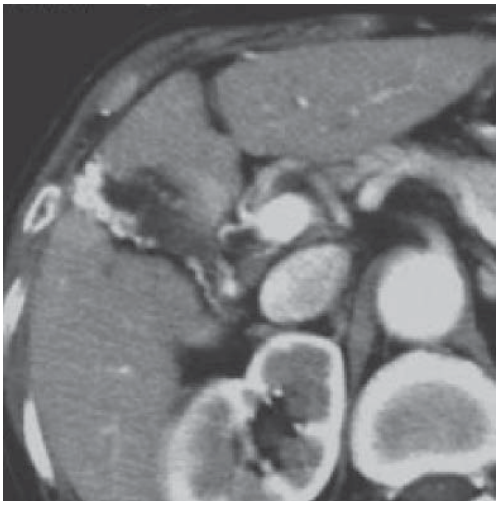

Fig. 3. Follow-up contrast-enhanced CT scan shows that blood flow in the gallbladder AVM was maintained

In the present case, transcatheter embolization of the cystic arteries at a proximal site was performed using microcoils prior to TACE to prevent portal embolization or gallbladder damage due to inflow of embolic particles. However, proximal feeder embolization should be avoided, as it has no role in treating AVMs and might result in the development of complex collateral arteries, potentially from the gastroduodenal artery or proximal hepatic artery, although this was not confirmed in the present case. The complicated collateral arteries would make it difficult to perform repeat TACE for recurrent or new HCCs. With regard to the treatment of a gallbladder AVM, permanent occlusion of the nidus with transcatheter embolization and cholecystectomy may be a viable alternative. When treatment for gallbladder AVM is required for lethal complications such as bleeding, it is predicted that both transcatheter embolization and surgical treatment would be difficult owing to the development of complex collateral aeries.

Angiography is the most definitive imaging method in this situation and was conclusive in the diagnosis of gallbladder AVM. The findings are similar to those of pancreatic AVM: dilated and tortuous feeding arteries, a racemose vascular network, and early-filling veins.[2,3] To the best of our knowledge, the present case is the first report of CT findings of gallbladder AVM in the literature. The differential diagnosis of a vascular abnormality surrounding the gallbladder on CT is gallbladder varices, which are associated with portal vein occlusion.[4,5] Although detection of dilated cystic arteries may lead to the diagnosis of gallbladder AVM, we could not distinguish cystic arteries from cystic veins on CT in the present case. Accordingly, multidetector-row CT angiography may be useful in the diagnosis of gallbladder AVM. As another finding of CT, focal enhancement of the liver surrounding the gallbladder was observed on arterial phase images. There is the possibility that arterial phase images may show abnormal perfusion from the gallbladder AVM, which may be characteristic of gallbladder AVM; and further examinations including CT during arterioportography and CT during arteriography are required to determine the hemodynamics of gallbladder AVM.

Conclusion

We have presented CT and angiographic findings of a rare case of gallbladder AVM. When a visceral AVM is found incidentally, as in the present case, careful consideration of the overall situation of the patient and planning for treatment for the lesion are required.

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