Extrahepatic Collateral Artery Extravasation in Patients with Ruptured Hepatocellular Carcinoma

Tomoya Nishiyama, MD, Minobu Kamo, MD, PhD, Saya Horiuchi, MD, Mariko Okura, MD, Kaoru Nakano, MD, Takashi Ikeya, MD, Naoki Ishii, MD, PhD, Yoshiyuki Fujita, MD, and Yasuyuki Kurihara, MD, PhD

ABSTRACT

This report describes 3 patients with previously untreated hepatic tumors who underwent embolization for the treatment of extravasation from extrahepatic arteries. Although development of extrahepatic collateral blood supply is well known, its importance in the presentation of rupture of liver tumors may be underrecognized. Findings that suggest bleeding from extrahepatic arteries include a discrepancy in the pattern of extravasation on computed tomography vs hepatic angiography and a lack of stabilization of vital signs after embolization of hepatic arteries. To achieve successful hemostasis in embolization, the potential involvement of such extrahepatic arteries should be accurately recognized, suggestive imaging findings considered, and the occult vessels selected and embolized.

ABBREVIATIONS

HCC = hepatocellular carcinoma, NBCA = *N*-butyl cyanoacrylate

The incidence of spontaneous rupture of hepatocellular carcinoma (HCC) is reported to range from 5% to 15% (1). In such situations, the first-line treatment is emergent transarterial embolization (2,3). The source of bleeding in such cases is usually 1 of the hepatic arteries. However, hepatic tumors without previous treatment also have the potential to develop extrahepatic collateral arterial supply (4–6). This can be an occult source of bleeding; although extrahepatic collateral feeding arteries are well recognized to develop after repetitive transarterial chemoembolization (4–9) and selective catheterization of those collateral vessels is required to adequately treat such tumors (5,6), the potential for such vessels to spontaneously bleed has received little attention (10). Here we report 3 cases of active bleeding from such extrahepatic collateral arteries associated with previously untreated hepatic tumors. An institutional review board exemption was granted for this report.

From the Departments of Radiology (T.N., M.K., S.H., Y.K.) and Gastroenterology (T.I., N.I., Y.F.), St. Luke's International Hospital, 9-1, Akashi-cho, Chuo-ku, Tokyo 104-8560, Japan; Department of Radiology (M.O.), Tokyo Metropolitan Police Hospital, Tokyo, Japan; and Department of Gastroenterology (K.N.), Cancer Institute Hospital Japanese Foundation for Cancer Research, Tokyo, Japan. Received June 8, 2017; final revision received September 27, 2017; accepted September 28, 2017. **Address correspondence to** T.N.; E-mail: radiology.nishitomo@gmail.com

None of the authors have identified a conflict of interest.

J Vasc Interv Radiol 2018; 29:564–567

https://doi.org/10.1016/j.jvir.2017.09.026

CASE REPORTS

Case 1

A 79-year-old man presented with worsening epigastric pain for 3 days. His blood pressure and heart rate were 111/59 mm Hg and 97 beats per minute, respectively. His hemoglobin level was 10.9 g/dL (normal range, 13.1–16.9 g/dL). His α-fetoprotein level and protein induced by the absence of vitamin K or antagonist II level were 2.0 ng/mL (normal range, 0–10.0 ng/mL) and 2,130 mAU/mL (normal range, 0–40.0 mAU/mL), respectively. His liver function was class A according to Child–Pugh classification. Contrast-enhanced computed tomography (CT) revealed a 3-cm exophytic mass in the anterior superior subsegment of the liver (segment S8), which was accompanied by marked extravasation of contrast medium into the peritoneal space (**Fig 1a**). The omentum was located at the surface of the liver near the tumor. He had a history of *Schistosomiasis japonicum* infection. Diagnosis of spontaneous rupture of HCC was made, and emergent embolization was performed.

Common hepatic angiography revealed tumor staining in the lateral part of the right lobe of the liver (**Fig 1b**). Subsequent selective angiography of the anterior superior

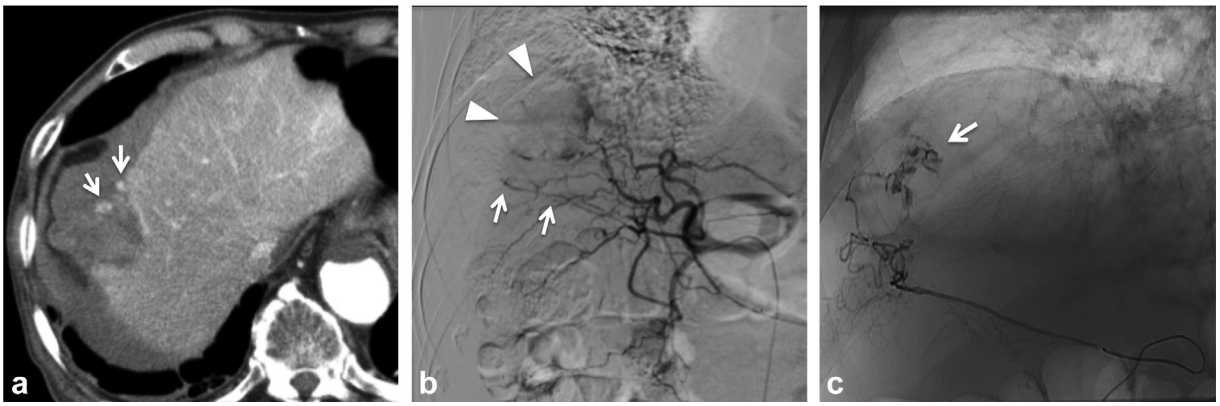

Figure 1. Images from a 79-year-old man with a ruptured HCC. **(a)** Axial contrast-enhanced CT image shows a 3-cm exophytic mass in the anterior superior subsegment of the liver (segment S8), which is accompanied by marked extravasation of contrast medium (arrows) into the peritoneal space. **(b)** Digital subtraction angiogram of the common hepatic artery in posteroanterior projection shows tumor staining in the lateral part of the right lobe of the liver. A focal area of defect in tumor staining can be observed on the hepatic artery angiogram (arrowheads). A branch of the epigastric artery is noted to extend to the tumor along the omentum (arrows). **(c)** Digital subtraction angiogram of the branch of the right gastroepiploic artery in the posteroanterior projection shows tumor staining with massive extravasation (arrow). Successful embolization was subsequently performed with the use of NBCA mixed with ethiodized oil at a ratio of 1:9.

subsegmental artery (segment A8) showed tumor blush without extravasation. Embolization of segment A8 was performed with the use of gelatin sponge particles (Gelpart; Nippon Kayaku, Tokyo, Japan). At that time, the possibility of extrahepatic collateral supply was considered, partly because the marked extravasation observed on the CT images was absent on the hepatic angiogram and partly because a focal defect in the area of the tumor stain was also apparent. Correlation of the CT and angiographic images suggested involvement of the epigastric artery, a branch of which extended to the tumor along the omentum (Fig 1a, b). Subsequent selective right epigastric artery angiography revealed tumor staining with marked extravasation (Fig 1c). Successful embolization of the artery was performed with the use of *N*-butyl cyanoacrylate (NBCA; Histoacryl; B. Braun, Melsungen, Germany) mixed with ethiodized oil (Lipiodol; Guerbet Japan, Tokyo, Japan) at a ratio of 1:9. The patient had no recurrent episodes of bleeding but died of aspiration pneumonia 3 weeks later, which was presumably unrelated to the embolization procedure.

Case 2

A 55-year-old man presented with a 24-hour history of sudden-onset right upper quadrant pain. He had been diagnosed as having hepatitis B–related HCC at another institution but had not undergone treatment. His blood pressure and heart rate were 142/108 mm Hg and 102 beats per minute, respectively. His hemoglobin level was 9.8 g/dL. His α-fetoprotein level and protein induced by the absence of vitamin K or antagonist II levels were 3.4 ng/mL and 39,000 mAU/mL, respectively. His liver function was class B according to Child–Pugh classification. CT revealed a 20-cm tumor occupying most of the right lobe of the liver with massive extravasation (Fig 2a). Diagnosis of spontaneous rupture of HCC was made, and emergent embolization was performed.

Common hepatic angiography revealed a large area of tumor staining at the right lobe of the liver without extravasation (Fig 2b). As in case 1, an area of staining defect in the lateral part of the tumor was noted, suggesting the presence of collateral supply (Fig 2b). Review of CT images suggested involvement of the right lower intercostal arteries because of the proximity of the defect to the right lower chest wall (Fig 2a). Subsequent selective angiography of the right 11th intercostal artery revealed tumor staining with marked extravasation (Fig 2c). Selective embolization of the artery was successfully performed with the use of absorbable gelatin sponge. The patient had no recurrent episodes of bleeding and was discharged from the hospital 1 week after the procedure. No further information was available after his discharge.

Case 3

A previously healthy 52-year-old woman presented with sudden onset of epigastric pain. She was in hemodynamically unstable condition, with a blood pressure of 73/48 mm Hg and a heart rate of 94 beats per minute. Her hemoglobin level was 5.1 g/dL (normal range, 11.1–14.9 g/dL). CT revealed an 8-cm heterogeneous tumor in the posterior segment of the liver, with internal hematoma formation and massive extravasation into the peritoneal space (Fig 3a). Spontaneous rupture of the hepatic tumor was suspected, and emergent embolization was performed.

Celiac artery angiography revealed heterogeneous staining of the hepatic tumor (Fig 3b). Selective angiography of the hepatic artery revealed faint extravasation. Embolization of the posterior segment of the hepatic artery was subsequently performed with the use of gelatin sponge particles. However, the patient's vital signs did not