An 82-year-old man underwent transarterial chemoembolization and radiofrequency ablation (RFA) for a 42-mm hepatocellular carcinoma in segment IV. Thirty-eight months later, he was admitted to our hospital for acute cholecystitis that had spread to the ablated area. After he started antibiotic treatment, the inflammatory reaction gradually improved, but he developed acute cholangitis, and massive hemobilia was observed during endoscopic retrograde biliary drainage. An angiogram showed both a pseudoaneurysm of the left hepatic artery (LHA) and extravasation of the microcatheter into a marginal lesion of the ablated area. The pseudoaneurysm was considered to have been formed by inflammation that perforated the ablated area and intrahepatic bile duct. After embolization of the LHA, no further bleeding was observed. A pseudoaneurysm may develop from an infection, even several years after liver RFA.

**Key words:** radiofrequency ablation, late complication, pseudoaneurysm, transarterial embolization

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with a maximum diameter of 42 mm (Fig. 1). No cholangiectasis was present, and therefore, TACE was performed on the 3 branches of the A4 from the LHA using epirubicin (Faromrubicin; Pfizer Japan Inc., Tokyo, Japan), lipiodol (Lipiodol; Guerbet Japan K.K., Tokyo, Japan), and gelatin sponge particle (Gelpart; Nippon Kayaku, Tokyo, Japan). Lipiodol accumulated in most of the tumor, but some weak accumulation areas were observed. RFA was performed using a single needle under CT fluoroscopic guidance 5 days after TACE. The RFA protocol was as follows: An internally-cooled electrode (Cool-Tip RF Ablation System; Medtronic, Minneapolis, MN) was inserted into the bottom of the tumor; the electrode was connected to the generator (Cool-tip RF generator; Medtronic, Minneapolis, MN); radiofrequency energy was applied starting at 20 W and then elevated 20 W per minute until break-down occurred at 80 W; radiofrequency energy was applied for 11 minutes with a total of 5 break-downs; the electrode was extracted with tracking ablation; the electrode was inserted to the right and left portions of the tumor sequentially; and RF energy was applied with the same protocol for 7 and 8 minutes, respectively, until 5 break-downs occurred. A contrast-enhanced CT was performed 1 month after the RFA and showed the HCC surrounded by the ablated area, and there were no signs of complications (Fig. 2).

The patient’s CT showed no late complications or local recurrence during the first 34 months after RFA. The patient was admitted to our hospital 38 months after the RFA because of fever and high inflammatory markers on laboratory examination. Contrast-enhanced CT revealed gallbladder dilatation and an air bubble in the ablated area (Fig. 3). The patient had no risk factors of cholangiectasis, such as biliary calculi, history of endoscopic sphincterotomy, or bile duct jejunum anastomosis. Therefore, we suspected that acute cholecystitis had spread to the ablated area. Ceftriaxone (CEFTRIAXONE; Chugai Pharmaceutical Co. Ltd., Tokyo, Japan) treatment was started. The patient’s general condition and inflammatory reaction gradually improved, but high fever developed again 48 days after admission. Cholangitis was suspected, because the patient’s inflammatory markers and biliary enzymes were elevated on laboratory examination, and ultrasonography showed a dilated intrahepatic biliary duct. We planned to perform an endoscopic retrograde biliary drainage, but massive hemobilia was observed, and therefore, emergency transarterial embolization (TAE) was performed.
Fig. 4. Emergency angiogram for massive hemobilia.

a) Angiogram from the celiac artery reveals a pseudoaneurysm (arrow) in the left hepatic artery.
b) The microcatheter is advanced from the pseudoaneurysm to the extravascular site. The contrast media is seen going through the rim of the ablated area and into the left intrahepatic biliary duct.
c) A mixture of n-butyl-2-cyanoacrylate and lipiodol is injected from the extravascular site after metallic coil embolization of the distal left hepatic artery.
d) After embolization, the angiogram from the celiac artery shows complete occlusion of the left hepatic artery.

An angiogram and CTHA of the celiac artery showed a pseudoaneurysm on the LHA (Fig. 4a). No obvious HCC was detected on the CTHA. The microcatheter extravasated from the pseudoaneurysm into a marginal lesion of the ablated area, and the injected contrast media flowed into the left intrahepatic bile duct (Fig. 4b). We suspected that the pseudoaneurysm was created by inflammation of a liver abscess that perforated the ablated area, and the bleeding spread to the intrahepatic bile duct. A metallic coil (TRUFILL Pushable Coils; Johnson & Johnson K.K., New Brunswick, NJ) was placed in the LHA distal to the pseudoaneurysm, and a 1:5 mixture of n-butyl-2-cyanoacrylate (Histoscyrl; B. BRAUN AESCULAP, Melsungen, Germany) and lipiodol was injected from the extravascular site. The mixture filled the pseudoaneurysm and the proximal site of the LHA (Fig. 4c), and the angiogram from the celiac artery showed complete occlusion of the LHA (Fig. 4d). The patient’s hemoglobin level was maintained, and no signs of bleeding were observed after the TAE. However, the patient developed aspiration pneumonia 10 days after the TAE and died of respiratory failure 2 days later.

DISCUSSION

Hemobilia in our patient developed from a pseudoaneurysm as a late complication of liver RFA. After RFA, ablated tissues usually show gradual involution. Infection or abscess formation in the ablated area may develop as a late complication of liver RFA [7]. Although relatively infrequent, a liver abscess may develop a pseudoaneurysm [8]. There have been some reports of TAE for hepatic artery pseudoaneurysms that developed from an infected biloma or idiopathic liver abscess after RFA [7, 8]. In our patient, one of the A4 branches coagulated by the RFA may have formed a pseudoaneurysm secondary to inflammation from the adjacent ablated lesion, even 3 years after the RFA.

Some of the reported risk factors for bleeding after liver RFA are coagulopathy, liver cirrhosis, tumor size, multiple punctures, and use of an expandable needle [4-6]. Our patient had a relatively high risk of bleeding because of liver...
cirrhosis, a relatively large tumor, and the need for 3 punc-
tures to achieve complete ablation. Our patient’s tumor was
too large (42 mm) to control by RFA per se. Combination
therapy with TACE and RFA has been reported to be more
effective at controlling HCC tumors >3 cm than TACE or
RFA per se [9, 10] and is recommended for large HCC tu-
mors [11]. Moreover, performing TACE before RFA has
been reported to reduce the risk of bleeding [4], and there-
fore, we performed TACE before RFA in our patient. No
signs of local recurrence of HCC on CTHA at the time of
TAE were observed. However, bleeding occurred in associa-
tion with an infection 3 years after the RFA. As a result, we
must consider the possibility of such complications after
RFA, especially in cases with a large ablated area.

In summary, pseudoaneurysm of the hepatic artery and
hemobilia can occur as late complications of RFA from the
spread of an infection, such as acute cholecystitis, to the ab-
lated area. Infection of the ablated area or a biloma can
sometimes occur after RFA and are usually treated with an-
tibiotics. However, we must be cognizant of the risk of
bleeding and pseudoaneurysm formation, even several years
after RFA, especially when the ablated area is located near
the hepatic artery.

Conflict of interest: The authors declare that they have no con-
licts of interest.

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