LETTER / Oncology

Transpulmonary radiofrequency ablation of hepatocellular carcinoma contiguous to the heart

Dear Editor

It is usually difficult and hesitant to perform percutaneous radiofrequency ablation (RFA) of hepatocellular carcinoma (HCC) contiguous to the heart. Herein, we describe a case of a HCC contiguous to the heart treated by transpulmonary RFA, after having received transcatheter arterial chemoembolization (TACE).

Case report

A 71-year-old woman with liver cirrhosis was referred to our department for the treatment of HCC. She had undergone RFA and/or TACE twice for multiple HCCs. On follow-up, dynamic computed tomography (CT) revealed an HCC, measuring 18 mm, in segment IV. This tumor was located contiguous to the right atrium (Fig. 1) and undetectable by ultrasonography. She opted for combined RFA with TACE as treatment.

TACE was performed with an injection of a mixture of 0.9 mL iodized oil (Lipiodol; Guerbet, Villepinte, France), 0.6 mL iodized contrast material, and 12 mg epirubicin, followed by gelatin sponge particles, from the right inferior phrenic artery. Next, RFA was performed 7 days after TACE. She was placed in the supine position and CT images were obtained to verify the tumor location and to determine the electrode trajectory. After local anesthesia, a 17-gauge single internally cooled electrode with a 3-cm non-insulated tip (Cool-tip; Covidien, Mansfield, MA) was advanced to the target under CT-fluoroscopy guidance. After being inserted into the tumor via the transpulmonary route (Fig. 2), the electrode was connected to a radiofrequency (RF) generator (CC1; Covidien) and RF energy was applied for 19 minutes. The electrode length of the transgressed lung parenchyma was 2.8 cm. The tumor temperature at the electrode tip was 67°C after RF application. Immediately after RFA, contrast-enhanced CT images of the lung and liver were obtained to assess the procedure and no complications were seen (Fig. 3).

Routine follow-up chest radiograph obtained 4 hours after RFA showed a large pneumothorax. Although she was asymptomatic, a 14-F chest tube was inserted and negative pressure of 10 cm H2O was applied continuously to the tube for suction. No other complications occurred. This tube was removed after 6 days, and she was discharged 10 days after RFA without any sequelae. Twelve months after RFA, the tumor had decreased in size, and no local progression nor delayed complications were seen on follow-up chest and abdominal CT imaging (Fig. 4).

Figure 1. An arterial phase axial computed tomography (CT) image before transpulmonary radiofrequency ablation (RFA) reveals a hepatocellular carcinoma (HCC) measuring 18 mm in diameter in segment IV, adjacent to the heart (arrow).

Figure 2. A CT-fluoroscopic image during RFA shows that a radiofrequency electrode penetrates the tumor by the transpulmonary approach. The visibility of the target tumor increased on CT because of the accumulation of iodized oil after transcatheter arterial chemoembolization (TACE).
There are many risks and disadvantages of performing RFA of HCCs contiguous to the heart. Firstly, because of the pulsation of the heart, an RF electrode insertion is difficult and the inserted electrode may migrate during RF application. Secondly, accidental insertion of an RF electrode into the heart and thermal injury to cardiac components can cause fatal complications [1]. Thirdly, a RF electrode is generally inserted via the transabdominal and/or transhepatic route under ultrasonography guidance, and using these routes is very difficult and dangerous because such tumors are often poorly visualized or undetectable by ultrasonography.

Percutaneous liver RFA is usually performed under ultrasonography guidance because of the relative simplicity, low cost, portability, and non-radioactive nature of ultrasonography. When the target site is poorly visualized or undetectable by ultrasonography, some modified approaches [2–4], such as artificial pleural effusion infusin, artificial ascites infusion, and artificial pneumothorax creation, are often used. However, these methods require an operator with extensive experience. The transpulmonary approach under CT guidance is another method that can be used for an RF electrode insertion into liver tumors.

TACE was performed from the right inferior phrenic artery before RFA because decrease in risk of bleeding and/or tumor seeding caused by the electrode insertion and increase in the visibility of HCC on CT images because of the accumulation of iodized oil [5]. Although HCCs are usually vascularized by the hepatic artery or its branches, they occasionally receive their arterial supply from extra-hepatic arteries [6]. The right inferior phrenic artery is well known as the main extra-hepatic artery [6] and this HCC was successfully performed TACE from this artery. In CT-guided RFA of lung tumors contiguous to the heart or aorta, Iguchi et al. [1] described that local control of these tumors was considerably lower than that of tumors not contiguous to these structures. They suspected that the electrode was not placed sufficiently close to these structures because of fear of its insertion into them. Increase in the visibility of our target HCC was very important to insert an RF electrode into the tumor safely and accurately under CT-fluoroscopy guidance.

In conclusion, we have reported a successful outcome in a patient with a single HCC adjacent to the heart and the inferior vena cava that was treated by transpulmonary RFA 7 days after TACE. However, these favorable results observed in a single patient should be validated by further studies.

Disclosure of interest

The authors declare that they have no conflict of interest concerning this article.

References


T. Iguchi a,c,e, D. Inoue a, M. Tatsukawa b, K. Yabushita b, K. Sakaguchi b, S. Kanazawa c

a Department of Diagnostic and Interventional Radiology, Fukuyama City Hospital, 5-23-1 Zao-cho, Fukuyama 721-8511, Japan
b Department of Internal Medicine, Fukuyama City Hospital, 5-23-1 Zao-cho, Fukuyama 721-8511, Japan

Department of Radiology, Okayama University Medical School, 2-5-1 Shikata-cho, Okayama 700-8558, Japan

* Corresponding author. Department of Diagnostic and Interventional Radiology, Fukuyama City Hospital, 5-23-1 Zao-cho, Fukuyama 721-8511, Japan.

E-mail addresses: iguchi@ba2.so-net.ne.jp (T. Iguchi), ebized@uoen.com (D. Inoue), ma34tatsu111@gmail.com (M. Tatsukawa), azuki_yabushita2002@yahoo.co.jp (K. Yabushita), kosakaguchi@city.fukuyama.hiroshima.jp (K. Sakaguchi), susumu@cc.okayama-u.ac.jp (S. Kanazawa)

http://dx.doi.org/10.1016/j.diii.2015.06.016