



# International Journal of Gerontology

journal homepage: <http://www.sgecm.org.tw/ijge/>



## Case Report

### Spontaneous Resolution of Pericardial Effusion in an Elderly Related to Monopolar Radiofrequency Ablation for Hepatocellular Carcinoma

Yen-Po Chen<sup>a</sup>, Chia-Yuan Liu<sup>a</sup>, Po-Hao Liao<sup>a</sup>, Wen-Chi Chao<sup>b</sup>, Tsang-En Wang<sup>a</sup>,  
Shen-Yung Wang<sup>a\*</sup>

<sup>a</sup> Division of Gastroenterology, Department of Medicine, MacKay Memorial Hospital, Taiwan, <sup>b</sup> Department of Critical Care Medicine, MacKay Memorial Hospital, Taiwan

#### ARTICLE INFO

Accepted 11 June 2018

#### Keywords:

hepatocellular carcinoma,  
pericardial effusion,  
thermoablation

#### SUMMARY

Hepatocellular carcinoma (HCC) is a leading cause of cancer in the world. The incidence is increasing by age. Radiofrequency ablation (RFA) is widely used for treatment of HCC especially for those in early stage. RFA have some advantages compare to surgery including lower cost, shorter hospital day and lower complication rate. However, there's still some rare but lethal RFA associated adverse events including cardiovascular complication. We hereby reported an elderly patient with HCC in left liver abutting the right atrium. The patient received monopolar RFA for treating HCC and had experienced pericardial effusion during RFA without immediate signs of cardiac tamponade. The HCC was successfully ablated without local recurrence and the pericardial effusion was spontaneously resolved without sequelae.

Copyright © 2019, Taiwan Society of Geriatric Emergency & Critical Care Medicine.

## 1. Introduction

Hepatocellular carcinoma (HCC) is the most common primary liver cancers, which has been the 2nd most common cause of cancer related years of life lost (YLLs) worldwide.<sup>1</sup> The incidence reaches the peak at approximately 70 year-old.<sup>2</sup> Surgical resection is widely considered as a curative treatment for early HCC. However, elderly patients usually carry higher incidence of comorbidities vulnerable to surgery-related complications and, overall, only less than 30% of patients are eligible for surgical resection.<sup>2</sup>

Radiofrequency ablation (RFA) is to produce heat locally by ionic agitation to achieve coagulation necrosis.<sup>3</sup> RFA is considered as a treatment of choice in early stage HCC because of comparable outcomes with surgical resection<sup>4</sup> and lower complication rate.<sup>5</sup> However, some complications including gastrointestinal perforation, diaphragm injury, gall bladder or bile duct injury, pneumothorax, pleural effusion are reported to be associated with RFA in HCC.<sup>6</sup> Techniques such as iatrogenic ascites or pleural effusion have been developed to safely perform RFA for HCCs in high-risk locations.<sup>7</sup>

Pericardial effusion is rare but potential lethal complication for liver RFA, which may lead to cardiac tamponade or cardiac arrest.<sup>7</sup> Here we presented an elderly patient with HCC in left liver abutting the right atrium received monopolar RFA for treating HCC and had experienced pericardial effusion during RFA which is rarely reported for HCC RFA.

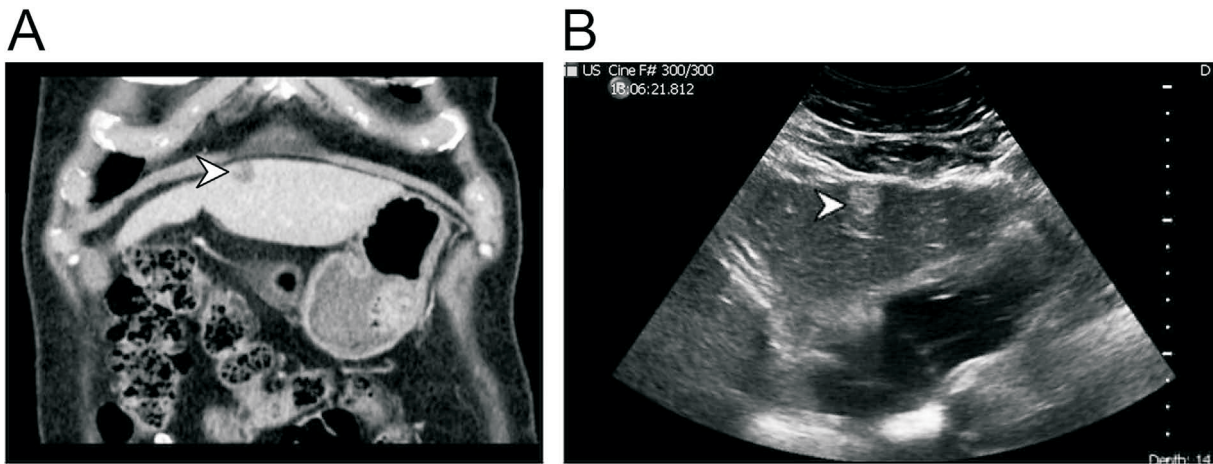
## 2. Case report

A 76-year-old male patient without history of chronic viral hepatitis was presented with two hepatic tumors revealed by abdominal ultrasound on January 2015. Dynamic CT showed two HCCs with typical enhancement in arterial phase and wash-out in delayed phase, but also several atypical lesions. The diameter of the largest lesion was 3.3 cm. The AFP was 264.15 ng/mL (normal range,  $\leq 10$  ng/mL). The tumor biopsy confirmed HCC. RFA was performed for treating multiple HCCs. After two RFA treatments, the AFP drop to 2.47 ng/mL. However, there still were three viable HCCs presented in the S2 (1.6 cm) (Fig. 1A and B), S7 (1 cm) and S8 (1.3 cm).

The 3rd session of RFA was intended to eradicate the remaining HCCs. RFA was performed under intravenous general anesthesia with continuous monitoring his vital signs, electrocardiogram, blood oxygen saturation and end tidal CO<sub>2</sub>. The insertion of RFA needle (Cool-Tip ACT 2030, Metronic) was guided by ultrasound (EPIQ7, Philips). A 12-min course of monopolar RFA had been applied for each lesion. After ablating of the HCCs in S7 and S8, we inserted RFA needle to the HCC in S2. Since the S2 lesion was close to diaphragm and heart, the location of needle tip was reconfirmed as properly positioned in the liver parenchyma before ablation. Ultrasound was continuously used to monitor the S2 lesion, diaphragm and pericardial space. Since the 6th minute after ablation, small amount of pericardial effusion was identified (Fig. 2A). The patient's blood pressure and heart rate had been stable at that time. The echogenicity of effusion was anechoic, and the right atrium was not collapsed (Fig. 2A). RFA had been continued and there's no signs of cardiac tamponade in the last 6 minutes of RFA despite of increasing amount of effusion. The patient recovered well after the procedure without events of cardiac or pulmonary compromise. Although a

\* Corresponding author. Division of Gastroenterology, Department of Medicine, MacKay Memorial Hospital, No. 45, Minsheng Rd., Tamsui District, New Taipei City, 25160, Taiwan.

E-mail addresses: sywang@mmh.org.tw (S.-Y. Wang).



**Fig. 1.** The relationship between hepatocellular carcinoma and pericardium before treatment. (A) Multiphase CT showed a hypodense tumor (arrowhead) in S2 close to diaphragm and heart. (B) Ultrasound revealed a hyperechoic tumor (arrowhead, subcostal transverse view) near the heart.

follow-up ultrasound revealed the persistence of pericardial effusion on the 3rd day (Fig. 2B), the patient had uneventful recovery and was discharged 3 days later. Complete necrosis of all HCCs was suggested by CT one month after RFA (Fig. 3A), and the pericardial effusion was totally absorbed spontaneously (Fig. 3B).

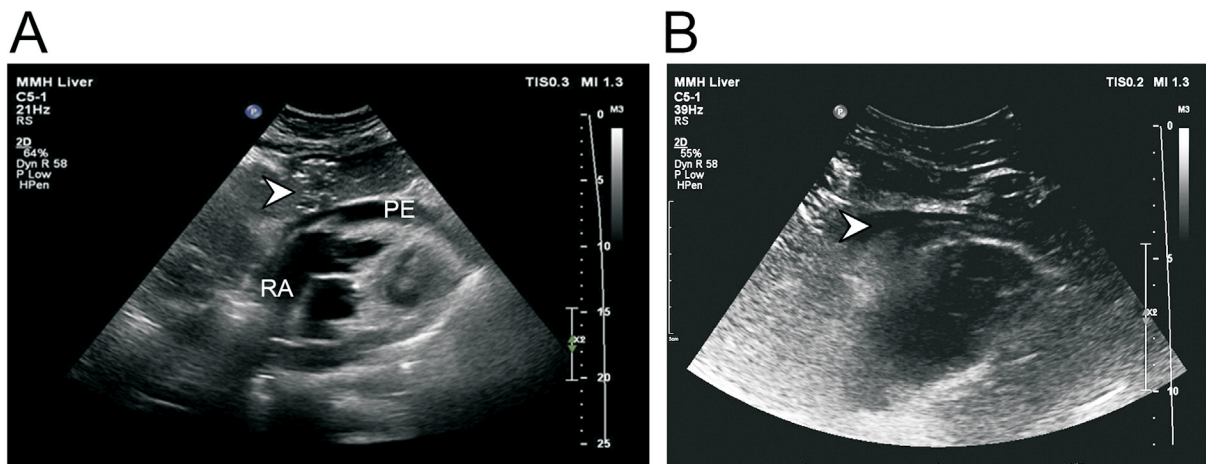
**3. Discussion**

Pericardial effusion is a rare complication associated for hepatic RFA. To our understanding, this is the first description of identification of occurrence pericardial effusion during RFA under real-time image monitoring. Several cases have been reported with occurrence of pericardial complications related to RFA for HCC, and the common character is the use of expandable multi-electrodes needle to ablate the tumor in S2 of liver. Because the breath movement or blunt image vision during the electrodes expansion, direct traumatic injury of pericardium is the cause of the formation of hemorrhagic pericardial effusion. If the pericardial effusion was hemorrhagic, it is likely to cause cardiac tamponade which is lethal,<sup>8</sup> in which emergent pericardiocentesis or surgery is necessary.<sup>9</sup> Thus, early detection of cardiac tamponade and aggressive management is critical under this condition for rescue life.<sup>9</sup>

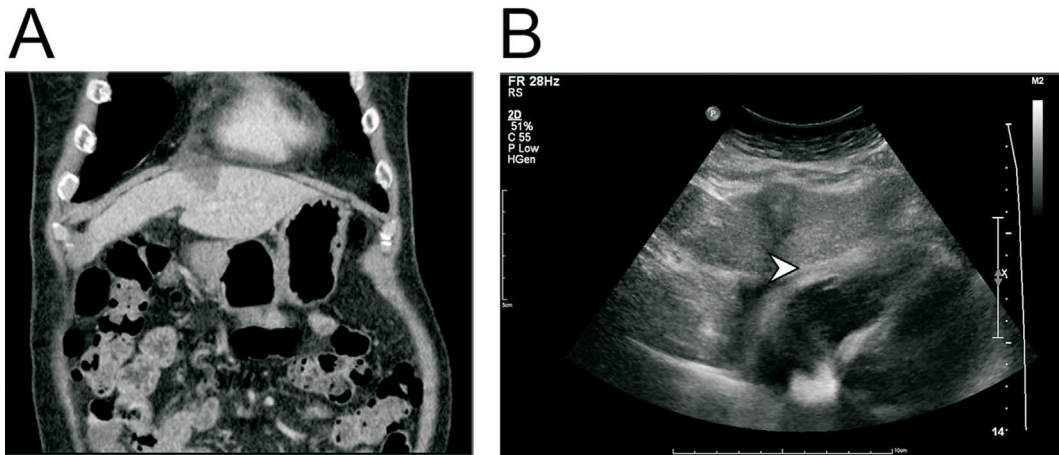
In our case, the electrode is a straight needle and its tip was monitored in real-time to retain its position within the liver during

the entire procedure. Thus, a reasonable cause of pericardial effusion is the thermal effect related to RFA. The thermal conduction to adjacent tissue may increase the permeability of small vessels, which lead to fluid accumulation in third space immediate during RFA or days later after RFA.<sup>10</sup> Such fluid accumulation is less profound and less likely to cause cardiac tamponade. It is usually absorbed spontaneously without aggressive interventions.<sup>10</sup>

Pericardial effusion is much more frequently observed during RFA for cardiac arrhythmia. The most common cause in this situation is thermal injury, but it often resulted in small amount of pericardial effusion. Cardiac RFA is performed with a much lower energy compared with that in liver tumor ablation. Hence, pericardial effusion is not profound in cardiac RFA and is usually asymptomatic. Regular or continuous cardiac ultrasound monitoring is not routinely required.<sup>11</sup> Based on experience and reports of cardiac RFA associated pericardial effusion, the management of pericardial effusion rarely occurred in hepatic RFA should be considered as followings. First, the patient’s vital signs should be closely monitored during the entire RFA procedure. Second, ultrasound is a convenient tool to provide real-time and continuous monitoring of the location of needle tips. If the pericardial effusion is hyperechoic under ultrasound and increased rapidly or the occurrence of clinical signs for cardiac tamponade, the procedure should be immediately terminated, and the patient should be evaluated for pericardiocentesis.



**Fig. 2.** Occurrence of pericardial effusion related to radiofrequency ablation. (A) A hypoechoic layer (pericardial effusion, PE) was found around the heart during RFA, the right atrium (RA) was not collapsed. (B) Decreased amount of pericardial effusion (arrowhead) 3 days later.



**Fig. 3.** Spontaneous resolution of pericardial effusion related to radiofrequency ablation. (A) Computed tomography one month after procedure revealed completely ablated S2 hepatocellular carcinoma abutting to diaphragm and pericardium. (B) The pericardial effusion was totally resolved (arrowhead).

On the contrary, if all of these warning signs were absent, hepatic RFA may be safe to complete the planned session to prevent ominous outcomes associated with incomplete ablation.

In conclusion, we described an elderly experienced with pericardial effusion related to RFA for HCC abutting the heart and diaphragm. RFA is a matured and widely accepted treatment for HCC, especially in the elderly. Despite of a lower complication rate compared with surgical resection of HCC, RFA still carries risks of lethal complications especially for HCCs in high risk location. Pericardial effusion can be occurred during hepatic RFA. Real-time and close monitoring is still required during RFA for early detect pericardial effusion to deal with hemorrhagic cardiac tamponade or cardiac rupture to decrease morbidity and mortality associated with this rare complication.

#### Conflicts of interest

No conflicts of interest to disclose.

#### Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ijge.2018.06.001>.

#### References

1. Global Burden of Disease Cancer C, Fitzmaurice C, Allen C, et al. Global, regional, and National cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 32 cancer groups, 1990 to 2015: a systematic analysis for the global burden of disease study. *JAMA Oncol.* 2017;3:524–548.
2. El-Serag HB. Hepatocellular carcinoma. *N Engl J Med.* 2011;365:1118–1127.
3. Nault JC, Sutter O, Nahon P, et al. Percutaneous treatment of hepatocellular carcinoma: state of the art and innovations. *J Hepatol.* 2018; 68:783–797.
4. Livraghi T, Meloni F, Di Stasi M, et al. Sustained complete response and complications rates after radiofrequency ablation of very early hepatocellular carcinoma in cirrhosis: is resection still the treatment of choice? *Hepatology.* 2008;47:82–89.
5. Fujiwara N, Tateishi R, Kondo M, et al. Cause-specific mortality associated with aging in patients with hepatocellular carcinoma undergoing percutaneous radiofrequency ablation. *Eur J Gastroenterol Hepatol.* 2014;26:1039–1046.
6. Curley SA, Marra P, Beaty K, et al. Early and late complications after radio-frequency ablation of malignant liver tumors in 608 patients. *Ann Surg.* 2004;239:450–458.
7. Holmes Jr DR, Nishimura R, Fountain R, et al. Iatrogenic pericardial effusion and tamponade in the percutaneous intracardiac intervention era. *JACC Cardiovasc Interv.* 2009;2:705–717.
8. Moumouh A, Hannequin J, Chagneau C, et al. A tamponade leading to death after radiofrequency ablation of hepatocellular carcinoma. *Eur Radiol.* 2005;15:234–237.
9. Silverman ER, Lai YH, Osborn IP, et al. Percutaneous radiofrequency ablation of hepatocellular lesions in segment II of the liver: a risk factor for cardiac tamponade. *J Clin Anesth.* 2013;25:587–590.
10. Chao WC, Liu CY, Lin CC, et al. Pleural effusion after percutaneous radio-frequency ablation for hepatic malignancies. *J Cancer Res Pract.* 2015;2:22–30.
11. Schaer BA, Maurer A, Sticherling C, et al. Routine echocardiography after radiofrequency ablation: to flog a dead horse? *Europace.* 2009;11: 155–157.