Clinical Case Report

Medicine®

OPEN

Small cell lung cancer treated by radiofrequency ablation

A case report

Guo-qiang Song, MD[a], Fei Chen, MD[a], Farong Zang, MD[a], Huoquan Lu, MD[a], Bin Lin, MD[a,b,*]

Abstract

Rationale: The morbidity and mortality of small cell lung cancer (SCLC), an uncommon malignancy of the lung, remain high. Radiofrequency ablation (RFA) creates heat to destroy cancer cells and is usually used to treat non-SCLC, but not SCLC.

Patient concerns: An 85-year-old male presented with a 2-month history of a productive cough with white phlegm and a 2-day history of hemoptysis. Chest computed tomography revealed a mass in the right lower lobe.

Diagnoses: An excision biopsy of the mass showed SCLC.

Interventions: We treated the tumor with RFA.

Outcomes: At the 2-year follow-up examination, the efficacy of the RFA was evaluated as a partial response.

Lessons: RFA can improve the prognosis of SCLC and should be considered for its treatment.

Abbreviations: CT = computed tomography, PR = partial response, RFA = radiofrequency ablation, SCLC = small cell lung cancer.

Keywords: case report, pulmonary mass, radiofrequency ablation, small cell lung cancer

1. Introduction

Small cell lung cancer (SCLC) is rare and is often at an advanced stage when diagnosed. The standard treatment for SCLC is chemotherapy and radiotherapy.[1] Radiofrequency ablation (RFA) generates thermal energy to create heat and destroy cancer cells. It is a new interventional radiological technique used to treat lung tumors in patients unsuitable for or who are reluctant to undergo traditional treatment.[2] Here, we present a case of SCLC treated with RFA that resulted in prolonged survival which was obtain by patient's consent.

2. Case presentation

An 85-year-old male presented to our hospital with a 2-month history of a productive cough with white phlegm and a 2-day history of hemoptysis in October 2014. He reported no fever, chest pain, chills, night sweats, or dyspnea.

On physical examination, the patient was afebrile. His heart rate was 80 beats per minute and regular, blood pressure 136/72 mm Hg, respiratory rate 20 breaths per minute, and oxygen saturation 99% while breathing ambient air. He was alert and not in acute distress. There was no lymphadenopathy in the neck. The lungs were clear and there were no heart murmurs. His abdomen was not tender, and there was no organomegaly. The neurological examination was unremarkable.

The patient's white blood cell (WBC) count was 3430/mL, with 51.3% neutrophils, 32.9% lymphocytes, and 10.8% monocytes; his hemoglobin was 117 g/L; his hematocrit was 38.9%; and his platelet count was 207,000/mL. The patient's C-reactive protein (CRP) level was normal. Serum chemistry tests showed the following results: sodium, 142.3 mmol/L; potassium, 3.9 mmol/L; chloride, 106.2 mmol/L; blood urea nitrogen, 5.9 mmol/L; creatinine, 86.3 μmol/L; aspartate aminotransferase, 21 U/L (normal range 15–40 U/L); and alanine aminotransferase, 16 U/L (normal range 9–50 U/L). The international normalized ratio was 1.02, the partial-thromboplastin time was 27.1 seconds, and the D-dimer level was 180 μg/L. The brain natriuretic peptide was 17.0 pg/mL; tumor marker tests revealed: carcinoembryonic antigen, 2.32 ng/mL; squamous cell carcinoma antigen, 0.90 ng/mL; neuron-specific enolase, 6.24 ng/mL; and CY211, 2.25 μg/L.

Computed tomography (CT) revealed a mass in the right lower lobe (Fig. 1A). Electrocardiography revealed sinus rhythm, with a ventricular rate of 79 beats per minute. No metastatic lesions were found on brain magnetic resonance imaging or in bone using emission CT.

The hemoptysis was treated with 30 mg of ambroxol and 600 mg of *p*-aminomethyl benzoic acid daily. Sputum cultures were negative. Lung function tests after inhaling 400 μg of albuterol yielded an $FEV_1/FVC = 59.7\%$ and $FEV_1 = 46.2\%$. Bronchoscopy showed stenosis in the posterior basal segment of the right lower lobe (Fig. 2). A CT-guided transthoracic needle lung biopsy showed SCLC after histopathological and immunohistochemical examinations (Fig. 3).

Editor: Eric Bush.

G-QS and FC contributed equally to this work.

The authors have no conflicts of interest to disclose.

[a] Department of Respiratory Medicine, [b] Department of Clinical Pharmacy, Changxing People's Hospital, Huzhou, Zhejiang, P.R. China.

[*] Correspondence: Bin Lin, Department of Respiratory Medicine, Changxing People's Hospital, 66 Taihu Road, Huzhou, Zhejiang 313100, P.R. China, Department of Clinical Pharmacy, Changxing People's Hospital, 66 Taihu Road, Huzhou, Zhejiang 313100, P.R. China (e-mail: lb_wzmc@126.com).

Medicine (2017) 96:46(e8674)

Received: 11 June 2017 / Received in final form: 1 September 2017 / Accepted: 26 October 2017

http://dx.doi.org/10.1097/MD.0000000000008674

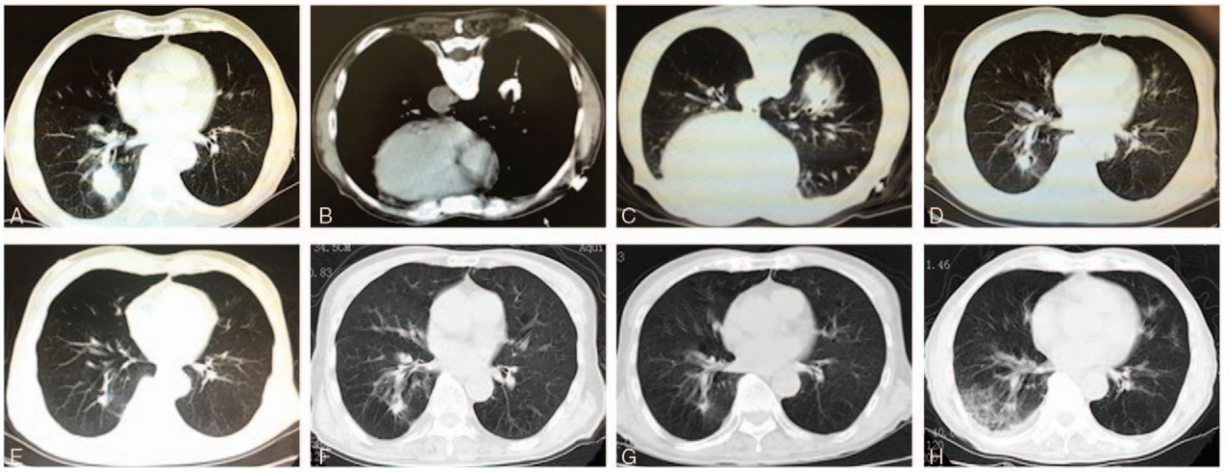

Figure 1. CT images of our patient. (A) The mass in the right lower lobe (October 9, 2014). (B) The effects of RFA (November 11, 2014). (C) The pneumothorax after RFA (November 11, 2014). Follow-up CT showing a PR to RFA on (D) January14, 2015; (E) March 17, 2015; (F) October 14, 2015; and (G) June 27, 2016. (H) Chest CT shows pneumonia and a PR (January 13, 2017).

Seven days after the transthoracic needle lung biopsy, the patient's temperature increased to 40°C and he developed a worsening cough with purulent sputum. Repeat laboratory tests showed a WBC count of 13,890/mL, with 87.0% neutrophils, 6.5% lymphocytes, and 0.9% monocytes; hemoglobin, 128 g/L; hematocrit, 38.70%; platelet count, 138,000/mL; and CRP, 88.0 mg/L. The patient was treated with cefuroxime (1.5 g) twice per day for 7 days and his WBC and CRP level normalized.

He refused radiotherapy or chemotherapy. After obtaining consent, we treated the tumor with RFA. Before RFA, we evaluated the size and spatial relationships of the tumor using CT and determined the needle angle and depth via the shortest route from the surface to the mass. The puncture point was infiltrated with 5 mL of 2% lidocaine. The multipolar needle was directed to avoid bone, large blood vessels, and pulmonary bullae. A rapid biopsy of the lung tumor was performed. Heating was directed to an area within 0.5 to 1 cm of the tumor margin and to the needle track (Fig. 1B). After closing the puncture wound, repeat CT showed pneumothorax (Fig. 1C), which was treated with bed rest and inhaled oxygen. The patient had some chest pain the next day, but there was no fever or hemoptysis in the first week after RFA.

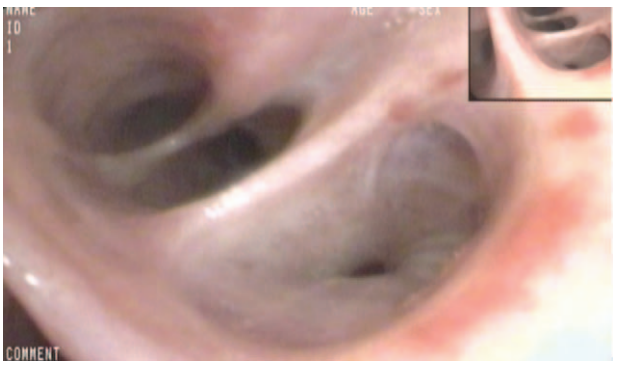

Figure 2. Stenosis of the posterior basal segment of the right lower lobe was seen on bronchoscopy.

At the 2-year follow-up examination, the efficacy of the RFA was evaluated as a partial response (PR) (Fig. 1D–G). The patient was last seen in January 2017, when he developed community-acquired pneumonia (Fig. 1H).

3. Discussion

Percutaneous radiofrequency thermal ablation, sometimes referred to as RFA, uses thermal energy produced by a generator to create heat and destroy cancer cells. The needle is guided by CT or ultrasound. It is a minimally invasive, relatively inexpensive cancer treatment. Initially, it was used mainly to treat hepatocellular carcinoma and other solid organ cancers.[3] Recent studies indicate that RFA may be a first-line treatment option for small hepatocellular carcinoma and renal cell carcinoma. In 2000, Dupuy et al[2] first treated lung cancer with RFA. It has been shown to be effective for the treatment of lung tumors, especially tumors less than 3 cm in diameter, with few complications.[4] Our patient's complications included pneumothorax and chest pain. RFA can be combined with chemotherapy for intermediate and advanced non-SCLC; this is significantly more effective than RFA or chemotherapy alone.[5]

SCLC comprises 13% to 15% of all lung cancers.[1] Tobacco use is the main cause of SCLC, and 95% of patients have a history of smoking. Although advanced SCLC is sensitive to chemotherapy and radiotherapy, nearly all patients ultimately relapse and the 2-year survival after diagnosis is only 5%.[6] There are few data on the treatment of SCLC with RFA. In one small cohort study of patients with SCLC who underwent percutaneous thermal ablation therapy, the median and 1-year overall survival rates were better in patients with local SCLC compared with disseminated disease (47.0 months vs 5.5 months and 100% vs 40%, respectively).[7] Our patient was a retired community doctor who knew about RFA and refused surgery, chemotherapy, and radiotherapy. The recurrence of lung cancer following RFA is common. Wan et al[8] reported that the local recurrence of SCLC was caused by the proliferation of micrometastases following RFA, which was driven by hypoxia-inducible factor-1α on mouse experiments.

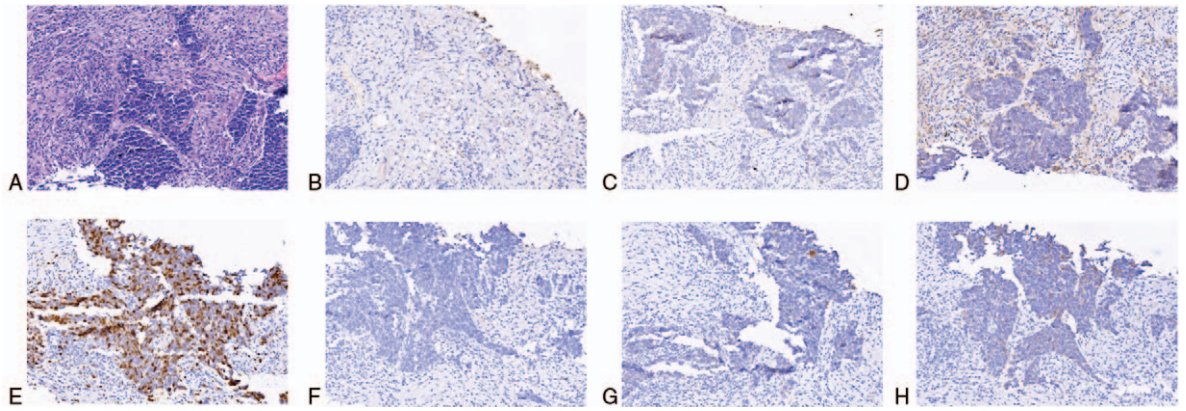

Figure 3. (A) Hematoxylin and eosin staining of the primary lung biopsy specimen revealed SCLC. The tumor was positive for (B) CD56, (E) Ki-67 (+++), and (G) CK5/6, and negative for (C) synaptophysin, (D) CgA, (F) TTF-1, and (H) CK-7.

After more than 2 years of follow-up, our patient's lesion was evaluated as partial remission without distant metastases, reflecting a satisfactory curative effect.

In conclusion, the diagnosis of SCLC is often challenging and requires radiological and pathological investigations. RFA should be considered as a new treatment for SCLC, especially for tumors less than 3 cm in diameter.

References

[1] Alvarado-Luna G, Morales-Espinosa D. Treatment for small cell lung cancer, where are we now? A review. Transl Lung Cancer Res 2016;5:26–38.
[2] Dupuy DE, Zagoria RJ, Akerley W, et al. Percutaneous radiofrequency ablation of malignancies in the lung. AJR Am J Roentgenol 2000;174:57–9.
[3] Brace CL, Hinshaw JL, Lubner MG. Thermal ablation for the treatment of abdominal tumors. J Vis Exp 2011;49:2596.
[4] Leveque N, Chabbert V, Prevot G, et al. [Radiofrequency ablation of primary lung cancer: a single centre experience]. Rev Mal Respir 2009;26:924–9.
[5] Yu S, Wu ZZ, Si HT, et al. Short-term effect analysis of radiofrequency ablation combined chemotherapy on middle and late period non-small cell lung cancer. Oncol Lett 2016;12:4399–402.
[6] Cariati M, Giordano G, Midulla M, et al. Radiofrequency ablation of pulmonary lesions. Radiol Med 2007;112:149–56.
[7] Maxwell AW, Healey TT, Dupuy DE. Percutaneous thermal ablation for small-cell lung cancer: initial experience with ten tumors in nine patients. J Vasc Interv Radiol 2016;27:1815–21.
[8] Wan J, Wu W, Zhang R. Local recurrence of small cell lung cancer following radiofrequency ablation is induced by HIF-1alpha expression in the transition zone. Oncol Rep 2016;35:1297–308.