Resolution of a life-threatening complication after lung radiofrequency ablation

Claudio Andreetti*, Giulio Maurizi, Francesco Cassiano° and Erino Angelo Rendina°

* Department of Thoracic Surgery, University of Rome 'Sapienza', Sant'Andrea Hospital, Rome, Italy
° Fondazione Eleonora Lorillard Spencer Cenci, Rome, Italy

* Corresponding author. Department of Thoracic Surgery, Sant'Andrea Hospital, Via di Grottarossa 1035, 00189 Rome, Italy. Tel: +39-06-33775773; fax: +39-06-33775578; e-mail: andreetticlaudio@gmail.com, claudioandreetti@libero.it (C. Andreetti).

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Abstract

Lung radiofrequency ablation (RFA) is an option for the treatment of unresectable lung cancer. Clinical investigators have previously warned against severe complications associated with this procedure. We report a case of life-threatening complication after lung RFA for non-operable non-small-cell lung cancer consisting of pulmonary abscess evolving into a bronchopleural fistula, severe pneumothorax and septic pleuritis, which was successfully treated with a multimodal conservative approach.

Keywords: Ablative therapy • Endoscopy • Lung fistula

INTRODUCTION

Surgery is the first-line therapy for non-small-cell lung cancer (NSCLC) and pulmonary metastases when feasible. The percentage of patients who are eligible for operation is only 20–30% at the time of diagnosis for NSCLC and it is less than 10% for lung metastases [1]. Chemotherapy and external-beam radiotherapy have been employed for the treatment of unresectable lung cancer. More recently, lung radiofrequency ablation (RFA) has also been accepted as an effective and safe therapeutic option in this subset of patients. Nevertheless, clinical investigators and the US Food and Drug Administration have warned against severe complications associated with this procedure [2]. We report a case of life-threatening complication after lung RFA consisting of pulmonary abscess evolving into bronchopleural fistula, severe pneumothorax and septic pleuritis, which was successfully treated with a multimodal conservative approach.

CASE REPORT

A 73-year-old man presented with non-operable lung cancer and with chronic obstructive pulmonary disease (forced expiratory volume in the 1st second 42.7%, 1.20 l). The histological diagnosis of adenocarcinoma was obtained by computed tomography (CT)-guided percutaneous lung biopsy. Clinical staging performed by 18-fluorodeoxyglucose positron emission tomography (PET)-CT showed multiple bilateral pulmonary nodules (two lesions in the right upper lobe, one in the middle lobe and one nodule in the left upper lobe). No radiological pattern of emphysema was observed at CT evaluation. No lymph-node metastases were detected. The clinical stage was IV (T4N0M1). The patient was not considered suitable for surgery and received chemotherapy. The patient underwent six cycles of chemotherapy with cisplatin and gemcitabine. At the PET–CT re-staging after chemotherapy only two lesions still remained: the main right and one contralateral nodule, respectively. The patient underwent lung RFA for the treatment of the right lung lesion (2.7 cm max Ø) 1 month after chemotherapy. That indication had previously been established in another institution. The radiofrequency electrode (Cool-Tip RF Ablation System; Valleylab, Boulder, CO, USA) was positioned in the middle of the tumour under CT guidance (Fig. 1A) and connected to a generator (Series CC-1; Valleylab). Radiofrequency energy was applied for 10 min using an impedance-control algorithm. A target temperature of 90°C and a maximum power of 150 W were used. The CT scan immediately after the procedure did not show complications. On Day 8, the patient suddenly showed tachypnoea, persistent cough, haemoptysis and fever (>39°C). The CT scan documented an important cavity lung lesion, pleural effusion and severe pneumothorax requiring chest drain placement (Fig. 1B). Severe air leakage was documented. On microbiological analysis of pleural effusion, Staphylococcus aureus and Streptococcus pneumoniae colonization were proved. We administered target intravenous antibiotic therapy and daily antibiotic topical pleural irrigation. Critical clinical conditions required endotracheal intubation and artificial ventilation support. On Day 16, a third CT control showed an increase in the size of the cavity lesion with a severe collapse of the right lung (Fig. 1C). Moreover, the air leak increased. We decided to close the propagating air leak by placing one-way endobronchial valves (EBVs; Zephyr™, Pulmoxn, Redwood City, CA, USA). The procedure was performed via a 5.5-mm flexible bronchoscope with a 2.8-mm operative channel. On the balloon selective occlusion test of the right upper lobe bronchus, we observed a remarkable reduction in the air leak. Three one-way EBVs (blue 4.0 mm) were placed to close the
right upper lobe bronchus. The patient’s clinical condition improved 7 days after the endoscopic procedure. An important reduction in the air leak was observed. The patient came back to the Department of Pulmonology after 13 days of intensive care unit management. We observed a decline of fever, and cessation of tachypnoea and haemoptysis. We continued with the antibiotic pleural irrigation once daily during this period. A new CT scan showed a significant reduction in the cavitary lesion’s size (Fig. 2A). A repeat microbiological examination of the pleural effusion was aseptic. We decided to use autologous platelet gel to close the cavity and to stop the air leak definitively. We have previously described the use of the autologous platelet gel to fill up residual pleural space [3]. The platelet gel–platelet-rich plasma (PRP) is a biological material made of autologous platelets, extracted from a small amount of the patient’s blood. PRP was prepared by the Blood Transfusion Centre directly at the patient’s bedside. From 45 ml of the patient’s venous blood, about 10 ml of

![Figure 1: Evolution of the lung lesion after the RFA. (A) The radiofrequency electrode placed at the centre of the tumour. (B) CT control shows an important cavitary lung lesion and incomplete lung re-expansion on postoperative Day 12. (C) CT scan shows an increase in the size of the cavitary lesion on postoperative Day 16. RFA: radiofrequency ablation; CT: computed tomography.](image1)

![Figure 2: Multimodal treatment: pleural irrigation, EBVs and autologous platelet gel. (A) CT control shows the EBVs placed into the segmental bronchi and partial lung re-expansion. (B and C) CT control shows the closure of the pleural cavity using the autologous platelet gel at 58 days from placement of the EBVs. EBVs: endobronchial valves.](image2)
autologous platelet gel was obtained, which we administered. We checked the haemoglobin level at the beginning, during and at the end of the process (range of levels 10.1–9.3). The antibiotic pleural irrigation was stopped during administration of PRP. After the fourth application, the air leak stopped and a subsequent CT scan showed the closure of the cavity (Fig. 2B and C). The good general condition of the patient allowed his discharge with a Heimlich valve. After 58 days of placement of the EBVs, we removed the chest drain.

**DISCUSSION**

Lung RFA is an option for the treatment of unresectable lung tumours. The mortality, major complication and minor complication rates associated with lung RFA have been reported as 0–5.6, 3.0–24.5 and 21.3–64.9%, respectively [4]. The most frequent complication is pneumothorax, which occurs in 30–53.8% of RFA sessions. However, chest drainage is required in less than 10% of interventions [5]. The life-threatening complication after RFA we have described occurred in a patient with a non-operable (M1a) 2.7 cm in diameter NSCLC. Our choice was to establish a conservative therapeutic strategy considering the clinical stage of the neoplasm and the poor clinical condition of the patient. The use of EBVs to treat low and medium air leaks has been previously documented in the literature [2]. In this case, more than 60% of the parenchyma of the right upper lobe was damaged by the previous RFA. In this life-threatening complication, the multidisciplinary treatment strategy was successful. The EBVs have reduced and then stopped the severe air leakage, with an immediate improvement of the patient’s clinical condition. The use of autologous platelet gel played an important role in tissue regeneration by being able to release a series of growth factors involved in the repair of the lesion. Moreover, the autologous platelet gel has permitted to seal the fistula definitively and to fill up the pleural cavity, reducing the risk of infection.

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**REFERENCES**