

## Case Report

# Lung Ablation for a Solitary Pulmonary Nodule (SPN) in a Patient with Previous Pneumonectomy: A Case Report

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## Abstract

Surgical resection remains the primary approach for recurrent lung cancer, yet cryoablation has emerged as a valuable option for inoperable cases. This case report demonstrates the successful utilization of percutaneous cryoablation in treating a Solitary Pulmonary Nodule (SPN) in a 47-year-old female previously pneumonectomized due to Non-Small Cell Lung Cancer (NSCLC). Given the patient's history and limited lung reserve, traditional surgical options were deemed high risk. Thus, a minimally invasive approach utilizing lung ablation was pursued. The procedure was successful without complication. At 24-month follow-up, there was no evidence of recurrence. Prior studies underscore favourable outcomes in post-pneumonectomy patients undergoing ablation procedures, with low complication rates. Overall survival rates suggest percutaneous ablation is a viable alternative in this population.

**Keywords:** Solitary pulmonary nodule; Pneumonectomy; Percutaneous ablation; Case report

## Introduction

Surgical resection remains the recommended treatment for recurrent lung cancer treatment. Cryoablation is an option for treating lesions in patients who are poor surgical candidates. Cryoablation preserves surrounding healthy lung tissue while effectively destroying the targeted nodule. Studies have indicated a minimal impact on pulmonary function, which is crucial for patients with limited lung reserve, such as post-pneumonectomy patients. Cryoablation consists of alternating cycles of freezing and thawing, leading to direct cellular and vascular injury. This case report describes the application of cryoablation in treating a solitary pulmonary nodule in a patient who had previously undergone pneumonectomy due to lung adenocarcinoma.

## Case Presentation

Per institutional guidelines, IRB exemption was waived for this clinical case report. A 46-year-old female with a history of stage IV non-small cell lung cancer (NSCLC) status post right pneumonectomy 5 years prior, presented with a growing 7 mm left anterior upper lobe nodule suspicious for neoplasm. Due to her previous pneumonectomy, she was considered not to be a candidate for surgical excision and was referred to the interventional clinic for consideration of percutaneous

cryoablation.

The patient was treated under conscious sedation using a combination of intravenous midazolam and fentanyl. Using CT guidance, anesthesia of the skin and soft tissue was performed with 10 ml of buffered 1% lidocaine, and pleural anesthesia was performed with 20 ml of 0.5% bupivacaine. Under CT-guidance, a single Galil IceSphere cryoprobe was inserted into the nodule. A triple freeze-thaw cycle consisting of active freeze of 5 minutes followed by a passive thaw of 5 minutes with interval CT scans was performed. The probe was removed following the thawing of the ice ball and a final scan was performed to document the treatment zone and assess for complication. Chest radiograph performed two hours after intervention demonstrated no pneumothorax and the patient was discharged to home. Follow-up 6-week PET-CT scan demonstrated posttreatment changes without FDG uptake in the treatment zone. Serial CT scans over the following 24 months after cryoablation reported curvilinear scar without evidence of recurrence (Figure 1).

## Discussion

Cryoablation is an established treatment alternative for patient who are of untenable surgical risk. The most common complications of cryoablation are pneumothorax and parenchymal hemorrhage. Complications are self-limited, easily managed, and rarely require surgical intervention. Most importantly, lung function is preserved in the setting of cryoablation. Cryoablation is increasingly being used to manage patients with oligometastatic disease. In the SOLSTICE trial, 128 patients with 224 lung metastases were treated with percutaneous cryoablation. Local recurrence-free response of the treated tumor was 85% at 12 months and 77% at 24 months. After a second cryoablation treatment for a recurrence tumor, the secondary local recurrence-free response was 91% at 12 months and 84% at 24 months [1]. In the ECLIPSE trial, 40 patients with lung metastases underwent cryoablation, showing strong local tumor control rates at 6 and 12

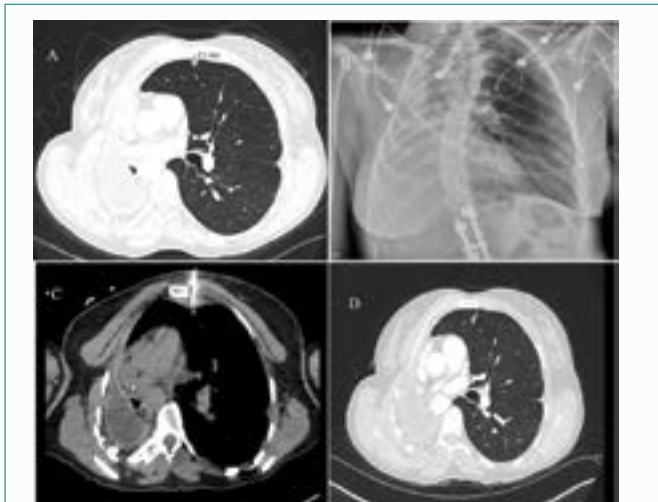
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**Figure 1:** A 46-year-old female with status post right pneumonectomy secondary to non-small cell lung cancer presented with a 7 mm LUL nodule suspicious for neoplasm. A): Tumor lesion on computed tomography before cryoablation; B): Chest x-ray showed evidence of right-side pneumonectomy; C): The cryoprobe punctured the lesion; D): the lesion significantly shrank 24 months after ablation with curvilinear scar.

months (96.6% and 94.2%). The one-year overall survival rate was 97.5% [2].

Two case series have reported outcomes for patients after microwave and radiofrequency ablation of lung malignancies in post-pneumonectomy patients. Sofocleus and colleagues reported a series of 12 patients with a history of pneumonectomy undergoing RFA or microwave lung ablations in 16 sessions. Three patients died within 12 days of the procedure. Causes of death included hemothorax and pulmonary failure. The median time to primary local tumor progression in the surviving patients was 18 months, and the median overall survival was 21 months [3]. Yang et al. [4] reported outcomes for a series of 11 post-pneumonectomy patients receiving microwave ablation for recurrent malignancy. There were no deaths within 30 days, however, 4 patients experienced local recurrences at one year of follow-up. Median overall survival was reported as 20 months, with 1-, 3-, and 4-year overall survival of 89%, 63%, and 42%. Additional case reports have also documented successful RFA and microwave ablation in post-pneumonectomy patients [5-7]. Yamauchi et al. [8] reported only two cases of cryoablation for pulmonary nodules in the residual lung after pneumonectomy. Neither patient experienced complication and there was no recurrence in 2 and 4-year follow-ups.

This case report demonstrates cryoablation as a viable treatment option for lung malignancy in patients with a history of pneumonectomy. By offering a minimally invasive approach that preserves healthy lung tissue while effectively targeting malignant lesions, cryoablation represents a valuable alternative for post-pneumonectomy patients.

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