



Scientific Letters

“Pole-tent” effect: an unreported complication of percutaneous marking of lung nodules with I-125 seeds[☆]

Efecto «tienda de campaña»: una complicación no descrita del marcaje percutáneo de nódulos pulmonares con semillas de I-125

To the Editor:

Several techniques have been described in recent years for the preoperative marking of pulmonary nodules under radiological guidance to assist resection by video-assisted thoracic surgery (VATS).¹ One of these techniques is computed tomography (CT)-guided percutaneous marking of pulmonary nodules using low-radiation I-125 seeds. The seeds emit gamma radiation, so they can be detected intraoperatively using a gamma detection probe.^{2,3}

We report a complication, not previously described, that occurred with this technique during the marking procedure. This complication, which we have called the “tent-pole effect”, occurred when it was impossible to cross the visceral pleural surface with the trocar (loaded with the radioactive seed), so the seeds were erroneously released into the pleural space. Nevertheless, the nodules were successfully removed by VATS and the seeds were recovered from the pleural cavity during surgery. This complication is described below in two patients with pulmonary nodules.

Patient 1 A 65-year-old woman, active smoker, with a mixed subpleural subsolid nodule in the right lower lobe (Fig. 1A). The patient had CT findings consistent with desquamative interstitial pneumonitis (Fig. 1B). Percutaneous marking of the pulmonary nodule was undertaken. Although it appeared during the marking procedure that the distal tip of the trocar was located in the pulmonary parenchyma (Fig. 1C), when the I-125 seed was released and the trocar was removed, the seed was observed in the pleural cavity (Fig. 1D). The patient underwent VATS surgery the following day, and a small hematoma was observed on the visceral pleural surface (caused by the puncture with the tip of the trocar) and an extended segmentectomy was performed.

Patient 2 A 58-year-old male, former smoker, with a subpleural subsolid nodule and areas of cavitation in the right upper lobe (Fig. 1E). As in the previous case, the impression during the marking procedure was that the distal tip of the trocar was located within the pulmonary parenchyma (Fig. 1F), but when it was checked, the seed was observed in the pleural cavity (Fig. 1G). The patient under-

went VATS surgery the following day, and a small hematoma was also identified in the visceral pleura that helped the surgeon safely and completely resect the pulmonary nodule (segmentectomy).

The definitive histological diagnosis in both patients was infiltrating adenocarcinoma (pT1b).

The demand for resection of pulmonary nodules is increasing due to the growing indication for pulmonary metastasectomies⁴ and improved detection of suspected nodules in lung cancer screening programs with low-dose CT of the chest.⁵ However, the small size or scant solid component of these nodules mean that they may be difficult for the chest surgeon to identify intraoperatively. In these cases, preoperative marking helps ensure complete and safe resection of pulmonary nodules.⁶ Multiple preoperative pulmonary marking techniques are available⁷; the main advantages of our technique lie in the reduced ability of the seed to mobilize after intrapulmonary release and the possibility of scheduling surgery days or weeks after the marking procedure.²

The procedure consists of percutaneous insertion of I-125 radioactive seeds via a trocar (18G in our center) from which the central stylet has been removed. Before inserting the trocar into the patient, the seed is introduced into the trocar and sealed with a small amount of bone wax to prevent the seed from coming out of the distal tip. Once the trocar is loaded, it is inserted into the patient through a small skin incision. After checking the correct position of the distal tip of the trocar within the pulmonary nodule to be resected, the stylet (which has a sharp tip) is then inserted through the trocar to push the seed and release it into the pulmonary parenchyma. Some complications associated with this marking technique have been described, including pneumothorax, pulmonary hemorrhage, and seed migration. However, the “tent-pole effect” complication has not been described previously. It occurs when the trocar fails to puncture the visceral pleura, in such a way that its distal tip pushes against or repels the visceral pleura (in a similar way to a tent pole) without perforating it. In CT images (during the marking procedure), an optical effect occurs in which it appears that the trocar has crossed the visceral pleura and that its distal tip is located within the lung, but in fact it has not perforated the visceral pleura. We believe that this complication may be due to several factors: 1) reduced perforating capacity of the beveled tip of the trocar (when introduced into the chest without the central stylet which acts as a needle with greater perforating capacity); 2) the “slippery” effect of the bone wax (on the visceral pleural surface) used to seal the trocar; 3) subpleural localization of the nodules, which offer some resistance to the trocar, making them difficult to penetrate; and 4) presence of subpleural interstitial lung disease in one of the patients (we believe that areas of subpleural inflammation might have made it difficult to puncture the visceral pleura). We also believe that this complication can be reduced by minimizing the amount of bone wax applied at

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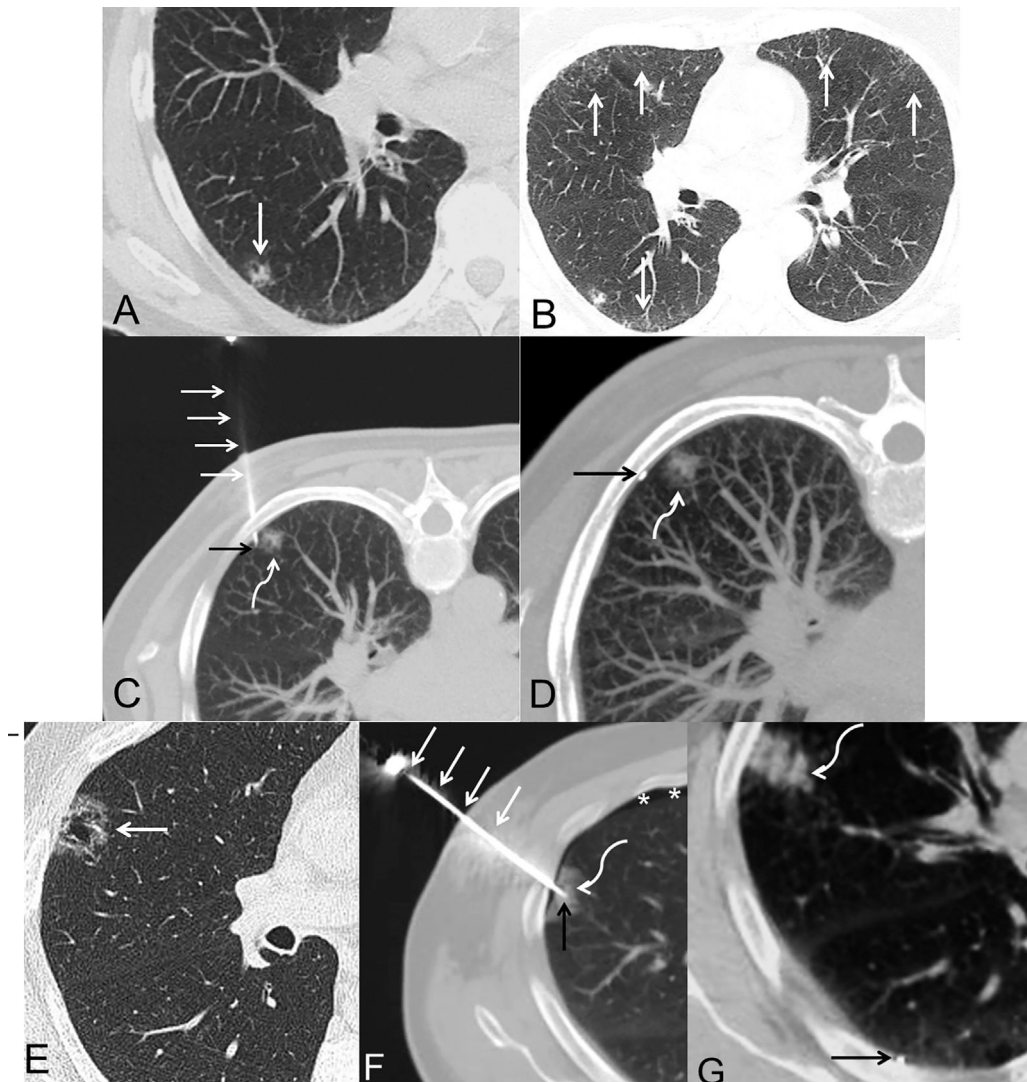


Figure 1. Patients 1 (A–D) and 2 (E–G). All images correspond to axial CT slices of the chest (lung parenchyma window). A) Image showing a mixed subpleural subsolid nodule (arrow) in the right lower lobe. B) Image identifying several bilateral subpleural ground glass attenuation opacities (arrows) consistent with a pattern of desquamative interstitial pneumonitis. C) Image with the patient in prone position, showing the trocar (straight white arrows) penetrating the chest wall, the distal tip of the trocar apparently in an intrapulmonary location (black arrow), and the pulmonary nodule (curved white arrow). D) Image with patient prone after trocar removal identifying extrapulmonary location of I-125 seed (black arrow), and the pulmonary nodule (curved white arrow). E) Image showing a mixed subpleural subsolid nodule (arrow) in the right upper lobe. F) Image showing the trocar (straight white arrows) penetrating the chest wall, the distal tip of the trocar apparently in an intrapulmonary location (black arrow), and the pulmonary nodule (curved white arrow). Note the appearance of a small lamellar pneumothorax (asterisks). G) Image after trocar removal identifying extrapulmonary location of the I-125 seed (black arrow) and subpleural hemorrhage (curved white arrow).

the distal tip of the trocar and attempting to release the seed close to the deep margin (further away from the visceral pleura) of the pulmonary nodule (avoiding its release near the subpleural space). We also recommend that surgery be expedited if this complication occurs, as there is likely to be a small hematoma “tattooed” on the visceral pleural surface that may facilitate resection of the pulmonary nodule.

Despite this complication, the nodules of both patients were successfully removed by VATS and the I-125 seeds were recovered from the pleural cavity during surgery. In our opinion, the description of this unprecedented complication can improve the selection of patients and anticipate this setback in patients with the characteristics listed above.

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Study of adherence to continuous positive airway pressure treatment in patients with obstructive sleep apnea syndrome in the confinement during the COVID-19 pandemic^{*}



Estudio de la adherencia al tratamiento con presión continua positiva en la vía aérea en pacientes con síndrome de apnea obstructiva del sueño en el confinamiento impuesto durante la pandemia de COVID-19

To the Editor:

The high transmissibility and lack of specific treatment for coronavirus disease-2019 (Covid-19) has prompted the authorities of most countries to impose temporary lockdowns on their populations to contain the spread of the disease.^{1,2} The potential health consequences of home confinement in this setting are not well characterized.³ Home continuous positive pressure ventilation (CPAP) is the treatment of choice for patients with obstructive sleep apnea (OSA)⁴ although its effectiveness depends largely on therapeutic compliance.⁵ In this study, it was suggested that difficulties in accessing the healthcare system and the anxiety produced by the situation could have a negative impact on adherence to treatment. Given its known cardiovascular implications, OSA has been proposed as a risk factor for a negative outcome in Covid-19.⁶

The main objective of the study was to compare the degree of compliance and adherence during lockdown in OSA patients previously included in a CPAP home monitoring program, compared with compliance during the previous 3 months, analyzing the influence of sex, age, and severity of OSA.

Patients diagnosed with OSA treated with CPAP (AirSense 10, ResMed) participating in a telemonitoring program were included in the study. Two study periods were defined: 1) baseline, from December 15, 2019 to March 14, 2020; and 2) follow-up during the first month of lockdown, from March 15 to April 14, 2020. Patients had to have been receiving treatment for more than 3 months at baseline to avoid any learning bias. The protocol was approved by the Ethics Committee (CEIC PI090-20).

CPAP telemonitoring data were received and stored automatically on the MyOSA web platform (Oxigen Salud, Barcelona, Spain), from which the following variables could be estimated: 1) daily use (number of hours divided by number of calendar days); 2) relative use (number of hours divided by days of use); 3) percentage of nights of use; 4) percentage of nights of use >4 h; 5) residual apnea-hypopnea index; 6) residual central apnea index; 7) residual obstructive apnea index; 8) mask leaks; and 9) 95% percentile of leaks. The criterion for adherence was use of CPAP for more than 4 h on 70% of nights.⁷

Statistical differences between the study periods (baseline before lockdown vs. follow-up during lockdown) were analyzed using the Wilcoxon signed-rank test for paired samples. The threshold for statistical significance was set at a *p* value of <0.01.

A total of 2956 patients with a median age of 63 years (interquartile range 54–71) were included in the study, 77.7% of whom were men. In total, 75.1% of patients were compliant at baseline, while at follow-up this figure increased to 79.5% (*p* < 0.0001). During lockdown, only a history of depression showed a trend towards worse adherence (*p* = 0.017).

Table 1 shows CPAP use and efficacy parameters during the study periods (baseline vs. follow-up). Overall, during the lockdown period, patients used CPAP for significantly more hours. With regard to treatment effectiveness, a significant decrease in residual obstructive events was observed during lockdown, although central events were significantly increased. In absolute values, leaks were significantly lower during lockdown.

It is important to note that after 1 month of lockdown, 27.3% of patients initially considered non-compliant became compliant, while only 3.7% of previous compliers became non-compliers.

Both men and women showed significant differences between the 2 study periods, with significantly greater use during lockdown regardless of sex. However, it should be pointed out that the number of residual obstructive events was significantly lower in men (0.51 vs. 0.48 events/h; *p* < 0.01) than in women (0.56 vs. 0.55 events/h); *p* < 0.059).

Similarly, significantly greater compliance was observed during lockdown in all age ranges, particularly patients ≥65 years of age.

With regard to OSA severity, the same general trends toward increased CPAP use during lockdown were observed. In terms of effectiveness, significantly lower rates of residual obstructive events (0.54 vs. 0.50 events/h; *p* < 0.01) and leaks (1.0 vs. 0.7 liters; *p* < 0.01) were observed during lockdown in patients with moderate to severe OSA. The rate of residual central events was systematically higher during lockdown, irrespective of sex, age, and severity of OSA.

Our findings show that lockdown led to greater compliance. These results are consistent with a recent study conducted by Attias et al.⁸ Similarly, Altena et al. found that the absence of strict working hours and the reduction of social activities may have led to an improvement in sleep quality during lockdown.⁹ However, the fear of becoming ill may have promoted better CPAP adherence, despite the possibility of transmission of infection due to mask leaks.^{10,11}

The pandemic has restricted the availability of healthcare for problems other than Covid-19, and this, combined with lockdown, has made it more difficult to access care. Telemedicine takes on special importance in this setting,^{12,13} since therapeutic monitoring can continue as it did before lockdown and patients can continue to receive healthcare.

The most important limitations of our study are that the degree of compliance with lockdown itself and the emotional, social, and employment status of patients are unknown, factors that could influence the observed trends.

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