



# T4 spine and thoracic wall invasive lung cancer treatment, case report

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**Background:** Locally advanced lung cancer represents a surgical challenge in terms of adding years of good quality of life to patients while avoiding the complications of surgery, which is why new techniques are developed despite its complexity.

**Case Description:** We present this case where a possible therapeutic diagnostic process with good outcomes is exposed, which adds it as a valid treatment in centers that have experience. We present a patient, former smoker, that consults with pleuritic pain and cough for 2 weeks of evolution, those were initially interpreted as a pneumonia/empyema, resistant to antibiotic treatment. However, a positron emission tomography-computed tomography (PET-CT) scan found a mass in the posterior segment of the right upper lobe (RUL) and bullae, a negative mediastinoscopy and CT scan were obtained, which reported an invasion of T6 and the costovertebral joint, a needle biopsy was performed that reported: undifferentiated carcinoma with necrosis. It was decided to perform a resection of the spinous processes and transverse processes plus a laminectomy and a vertebrectomy of T6 and T7 and an upper right lobectomy, and a resection of posterior rib arches 5, 6, 7 and 8. The pathological anatomy results obtained were: large cell carcinoma. The patient was recovered and pending on oncological treatment.

**Conclusions:** Vertebral and pulmonary resections are technically possible, although they must be performed in centers with experience in those procedures, thus reducing the possibility of residual disease or post-surgical complications.

**Keywords:** Lung; cancer; invasive; spine; case report

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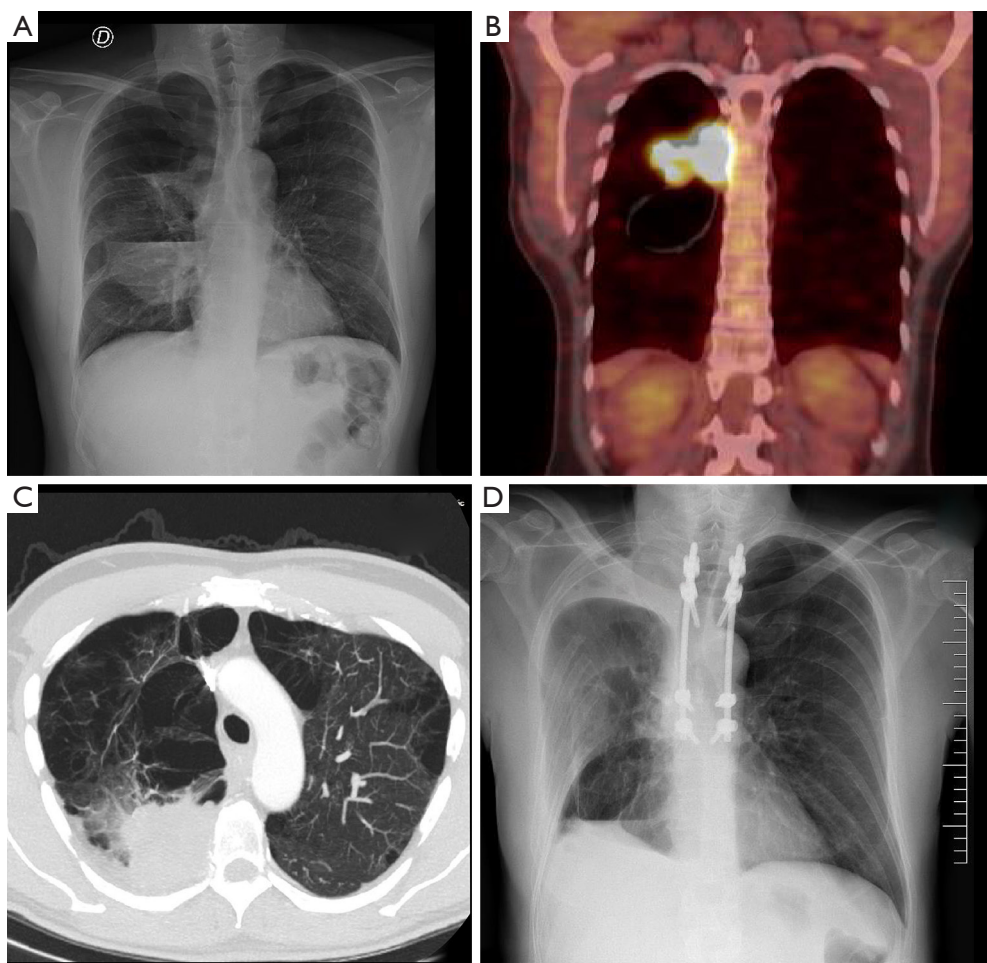
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## Introduction

Lung cancer is a disease with a high mortality rate and an impact on the quality of life of our patients, being the second most common cancer and the first cause of death from cancer in the world; which forces us to make a constant effort in early diagnosis and curative treatment. However, locally advanced cancer represents a surgical challenge due the possibility of adding years with quality of

life without the comorbidities associated with the procedure (1,2). For this reason, various protocols and techniques have been developed with the aim of performing complete resections with minimal residual disease in spite of the great technical difficulty. We present the following case in accordance with the CARE reporting checklist (available at <https://shc.amegroups.com/article/view/10.21037/shc-21-35/rc>).

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**Figure 1** Pre- and post-operative imaging tests. (A) X-ray at diagnosis. (B) Pre-surgical PET-CT. (C) Pre-surgical CT. (D) X-ray at discharge. PET-CT, positron emission tomography-computed tomography; CT, computed tomography.

### Case presentation

We present a 50-year-old patient, former smoker on varenicline, with a history of pulmonary emphysema diagnosed 20 years ago, who consulted for 2 weeks of evolution of right pleuritic pain that did not resolve with non-steroidal anti-inflammatory drugs (NSAIDs); because it adds cough as a symptom the patient consults in the emergency room where the physical examination was normal, eupneic, an analysis is performed without pathological findings, a negative test for SARSCoV-2 and a chest radiograph (*Figure 1A*) that shows right pleural effusion with air-fluid level in the apical segment of the right lower lobe suggestive of “abscess/empyema” initiating antibiotic therapy. After completing the treatment without clinical or radiological improvement, it was decided to

carry out a computed tomography scanner (CT-SCAN) that describes a sub-pleural spiculated mass in the posterior segment of the RUL with a diameter of 63 mm accompanied by a cyst with hydro-pneumothorax, with pleural and mediastinal contact and a 15 mm hilar adenopathy. A more extensive study was carried out using 18 fluorodeoxyglucose-positron emission tomography/CT (18FDG-PET-CT) (*Figure 1B*) that showed an intense uptake of the mass standardized uptake value (SUV-max) of 13.1 and hilar adenopathy (SUV-max 2.6) with an no metabolic behavior of the cyst; a magnetic resonance imaging (MRI) that reports: a solid mass with spiculated edges accompanied by cyst with content, suggesting the differential diagnosis between cystic adenomatoid malformation or bronchogenic cyst; relevant for the association with malignant transformation; finally the CT

Timeline		
Pleuritic chest pain clinic	07.01.2021	Treatment with NSAIDs
Persistence of symptoms adding cough	22.01.2021	X-rays
	25.01.2021	Treatment with antibiotics
Persistence of symptoms		First visit with Pulmonology
		CT-SCAN, PET, MRI and biopsy
	04.2021	Surgery
	03.05.2021	Discharge
	17.05.2021	
	26.05.2022	Last follow-up: alive without evidence of recurrence

**Figure 2** Diagnostic-therapeutic timeline. NSAIDs, non-steroidal anti-inflammatory drugs; CT-SCAN, computed tomography scanner; PET, positron emission tomography; MRI, magnetic resonance imaging.

(Figure 1C) showing vertebral infiltration at the level of T6 and the costovertebral joint. For the histological diagnosis, a CT-guided fine needle aspiration (CT-FNA) puncture was performed, reporting: undifferentiated carcinoma with necrosis and positivity for CK CAM5.2. Thus, it is oriented as a cT4N1M0 non-small cell carcinoma of lung origin. Due to the size, local infiltration and lymph node involvement, it was decided to perform a video mediastinoscopy for staging, which ruled out mediastinal lymph node involvement. After performing pulmonary function tests and evaluating it by the multidisciplinary oncology committee, surgery was decided. The intervention was then divided into two stages. The first one carried out by a neurosurgery team that by posterior approach in the prone position, performed the percutaneous fixation of vertebral bodies T4 to T9 left and T4-T5, T8-T9 right. Later, a laminectomy and hemi-vertebrectomy of T6 and T7 under radiological control was performed. In a second stage, with the patient in the lateral decubitus position, the thoracic surgery team, by means of a right posterolateral thoracotomy, performed the in-bloc resection of the right upper lobe (RUL), the 5th to 8th posterior costal arches and the previously prepared T6-T7 hemivertebrae. The patient was transferred to an intensive care unit, being extubated in the first 24 hours, without requiring vasoactive drugs and started oral tolerance 24 hours after surgery. After optimizing pain control, the patient was transferred to a conventional hospital ward where began to walk with a girdle and started respiratory rehabilitation; the drains were removed on the 5th and 13th postoperative day and was discharged on the 14th day (Figure 1D). The pathological analysis confirms a poorly differentiated large

cell carcinoma with diffuse infiltration of the spongy bone tissue pT4N0M0 stage IIIA R1, the immunohistochemistry is positive for PD-L1 with mutated TP53. The patient is autonomous and maintains a good quality of life while completing cancer treatment through chemotherapy and radiotherapy without evidence of recurrence even a year after surgery (Figure 2).

All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committees and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

## Discussion

Vertebral resection surgery for direct invasion of lung cancer is technically possible and safe (2-4) meeting resectability criteria. Prognostic factors after surgical intervention for lung neoplasms that invade the wall or spine are the absence of nodules (N) at diagnosis (5,6), complete resection (4,5), and response to chemotherapy (6-10). When there is bone infiltration, it is not possible to evaluate the microscopic resection margins intraoperatively. For this reason, even in centers with extensive experience, in 15–20% of cases the margins are affected in the final pathological analysis (1-4), requiring completion of the oncological treatment by radiotherapy (7,8). Another controversial point in these cases is the induction strategy. There are multiple clinical trials that have randomized patients between isolated

surgery *vs.* chemotherapy induction followed by surgery. Some of these have standardized certain parameters for the induction of patients prior to surgery, however, others practice it in all cases. Whether or not induction is applied, the need to obtain disease-free margins are the same, the application of adjuvant treatment being essential regardless of whether or not neoadjuvant treatment was used (3). The neoadjuvant treatment has been shown to improve disease progression-free in certain groups (superior sulcus tumors) without showing statistically significant improvements in long-term survival in all advanced-stage tumors (11). Studies on long-term results such as the one by Fadel *et al.* (4) have shown that there was a non-significant increase in local recurrence in patients with positive resection margins, considering that adjuvant treatment and radiotherapy were performed in all cases. Some groups prefer to perform surgery to assess the margins (7,8) while others defend better results after inductions with complete response. In our case, the patient was evaluated by a thoracic tumor board and since it is not a tumor of the superior sulcus, the original sample was reported as indeterminate carcinoma and it was a locally advanced tumor, surgery was decided without prior induction therapy. In our opinion, vertebral infiltration should not be considered a contraindication for surgery. In selected cases, in experienced centers, patients can benefit from a surgical approach, demonstrating promising survival results (5,6).

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## Footnote

*Reporting Checklist:* The authors have completed the CARE reporting checklist. Available at <https://shc.amegroups.com/article/view/10.21037/shc-21-35/rc>

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*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related

to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committees and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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