



“A DOUBLE TWIST” PRESENTATION – A CASE REPORT OF PURULENT CARDIAC TAMPONADE FOLLOWING A RARE COMPLICATION OF SMALL-CELL LUNG CANCER RADIOTHERAPY

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Received: 17/03/2024 **Accepted:** 25/03/2024 **Published:** 23/04/2024

Conflicts of Interests: SS received payments or honoraria for lectures and presentations from AstraZeneca, Pfizer, Roche and Bristol Myers Squibb and support for attending meetings and/or travels from Roche, Pfizer, AstraZeneca and MSD; JM received payments or honoraria for lectures and presentations, participation on advisory boards of Amarin, AstraZeneca, Bayer Healthcare, Bial, Boehringer Ingheleim, Daiichi Sankyo, Ferrer, Menarini, Servier; The other authors declare no conflict of interest.

Patient Consent: We have obtained written informed consent from the patient, to secure permission for publishing his clinical history.

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How to cite this article: Amorim D, Gonçalves CM, Cabral M, Silva S, Saraiva F, Morai J, Feijó S. “A double twist” presentation – a case report of purulent cardiac tamponade following a rare complication of small-cell lung cancer radiotherapy. *EJCRIM* 2024;**11**:doi:10.12890/2024_004477

ABSTRACT

Background: Small cell lung cancer is an aggressive tumor with a poor prognosis that requires prompt treatment. While radiotherapy may enhance survival when superior vena cava syndrome is present, radiation therapy-induced pericardial disease can be a potential complication.

Case Report: A 55-year-old man, who recently underwent radiotherapy for stage IV small-cell lung cancer complicated by superior vena cava syndrome, presented with chest pain and dyspnea. In the emergency room, he was dyspneic, hypotensive, and tachycardic. Pulmonary auscultation revealed the absence of lung sounds on the right. The initial electrocardiogram showed ST-segment elevation in lateral leads and in lead DII, with reciprocal changes in lead DIII. A bedside transthoracic echocardiogram revealed cardiac tamponade and emergent pericardiocentesis was performed, removing 500 ml of purulent fluid, resulting in an immediate clinical improvement. Thoracentesis was also performed, showing no empyema. Large spectrum empirical antibiotic therapy was started. Cultures from the pericardial fluid and peripheral blood grew multi-sensitive *Streptococcus pneumoniae*. Cytological analysis of the pericardial fluid was consistent with infection. The patient improved after 2 weeks of targeted antibiotic therapy and underwent the first cycle of chemotherapy. He was discharged with an early scheduled pulmonology appointment.

Conclusions: Although the most common causes of pericardial effusion in lung cancer are malignant, non-malignant etiologies should also be considered. This patient had an infectious pericardial effusion most probably due to a pericardial-mediastinal mass fistula caused by radiotherapy. This was a diagnostic challenge, both in the emergency room as well in the inpatient setting.

KEYWORDS

Small cell lung cancer, STEMI, cardiac tamponade, differential diagnosis, radiotherapy



LEARNING POINTS

- Small cell lung cancer is a fast-growing cancer that exhibits aggressive behavior.
- In patients with lung cancer, malignant pericardial effusions are more common than non-malignant ones.
- Purulent pericardial effusions, especially those due to lung cancer, are rare in developed countries with very few reports in the literature.

INTRODUCTION

Small cell lung cancer (SCLC) is a fast-growing cancer that exhibits aggressive behavior, rapid growth, early spread and special sensitivity to chemotherapy and radiation^[1]. Most pericardial effusions in cancer patients are related to their malignancy. Purulent pericarditis is a rare condition that occurs most commonly from adjacent intrathoracic lesions. Cardiac tamponade caused by pericardial effusion has a high mortality rate; thus, it is important to diagnose and treat this condition as soon as possible^[2]. Clinical suspicion and a rapid analysis of the case are of the utmost importance for proper and adequate treatment, not only in the emergency room but also in the inpatient setting. We describe a rare complication of treatment of SCLC presented as ST-segment elevation myocardial infarction (STEMI).

CASE DESCRIPTION

We present a case of a 55-year-old man, with a 40 pack-year smoking history, and a recent diagnosis of stage IV SCLC complicated by superior vena cava (SVC) syndrome. Due to SVC syndrome at presentation, he underwent emergency radiotherapy at the end of December 2023, with a total dose of 12Gy in three fractions (Fig. 1). One week after finishing

radiotherapy, he came to the pulmonology appointment, presenting with chest pain and severe dyspnea. He reported several episodes of likely non-cardiac chest pain and cervical growing masses over the past month and complained of acute dyspnea on that day. He was markedly dyspneic, hypotensive (80/40 mmHg) and tachycardic (140 beats per minute), with 95% peripheral saturations in room air. Pulmonary auscultation revealed the absence of lung sounds on the right. He was taken to the emergency room. The initial electrocardiogram (ECG) showed sinus rhythm at 132 bpm with STE in lateral leads (I, aVL, V4-V6) and in lead DII, with reciprocal changes in lead DIII (Fig. 2). At this point, STEMI was suspected. Cardiology was contacted and loading doses of aspirin were administered. However, as the patient was unstable, a bedside transthoracic echocardiogram (TTE) was performed, revealing a severe pericardial effusion (PE) (~36mm) with right atrial and ventricular collapse during diastole and a dilated inferior vena cava (Fig. 3A and Video 1). Emergent echocardiographically-guided pericardiocentesis was performed and 500 ml of purulent fluid was removed (Fig. 3B), resulting in an immediate improvement in hemodynamic and clinical status. Subsequently, a drain was left in place and the pericardial fluid was sent for analysis. Large spectrum

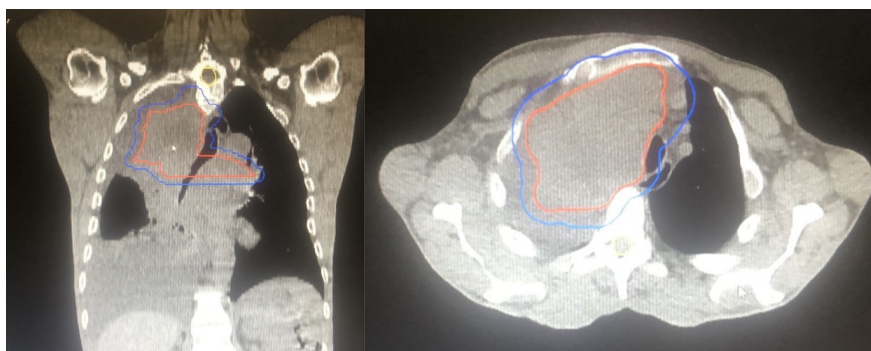


Figure 1. Radiotherapy planning. The red line indicates the clinical target volume, and the blue line indicates the planning target volume.

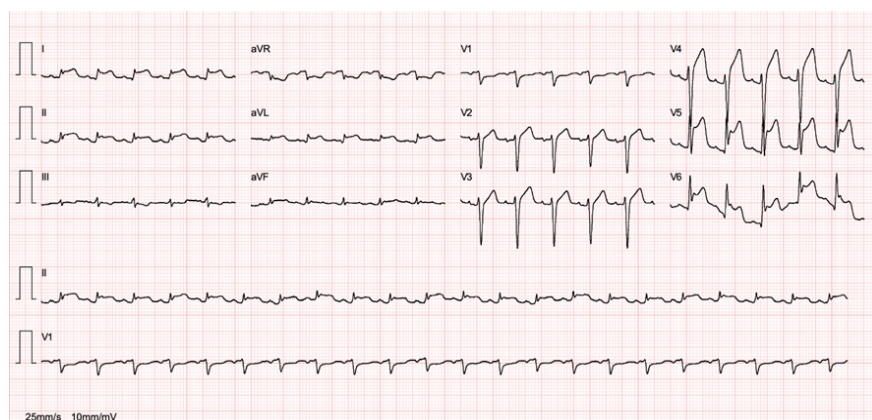


Figure 2. Initial ECG showing ST-elevation in lateral leads and DII.



Figure 3. A) Transthoracic echocardiogram revealing pericardial tamponade and B) drained purulent pericardial fluid.



Video 1. Transthoracic echocardiogram revealing pericardial tamponade.

<https://youtu.be/1FwXB5edyIU>

empirical antibiotic therapy was immediately started. After the emerging resolution of cardiac tamponade, complementary diagnostic tests were continued. A contrast-enhanced chest computed tomography (CT) scan revealed a right pleural effusion and a large, heterogeneous, and necrotic mediastinal mass, with deviation of the trachea and invasion of the right pulmonary artery (that had a thrombus in the lower portion), as well as compression of the left atrium and an apparent plane of continuity with the pericardium (Fig. 4). Repeat TTE revealed normal biventricular function and moderate PE (14 mm) without hemodynamic criteria for cardiac tamponade. Therefore, intermediate-low risk acute pulmonary embolism was diagnosed and therapeutic anticoagulation with enoxaparin was initiated. A chest drain was also placed, with the release of serous pleural fluid, with characteristics of exudate but neither empyema nor complicated pleural effusion.

Initial blood work revealed leukocytosis ($29.4 \times 10^3/\mu\text{l}$) with neutrophilia and elevated C-reactive protein (438.6 mg/l), procalcitonin (78 ng/ml) and D-dimer (2747 ng/ml) levels. Two separate measurements of high-sensitivity cardiac troponin I were within the normal range (10.8 and 10.7 pg/ml) and N-terminal pro-B-type natriuretic peptide was elevated (2590 pg/ml).

The patient was admitted to intermediate care for further management. The next day, pericardial fluid, as well as

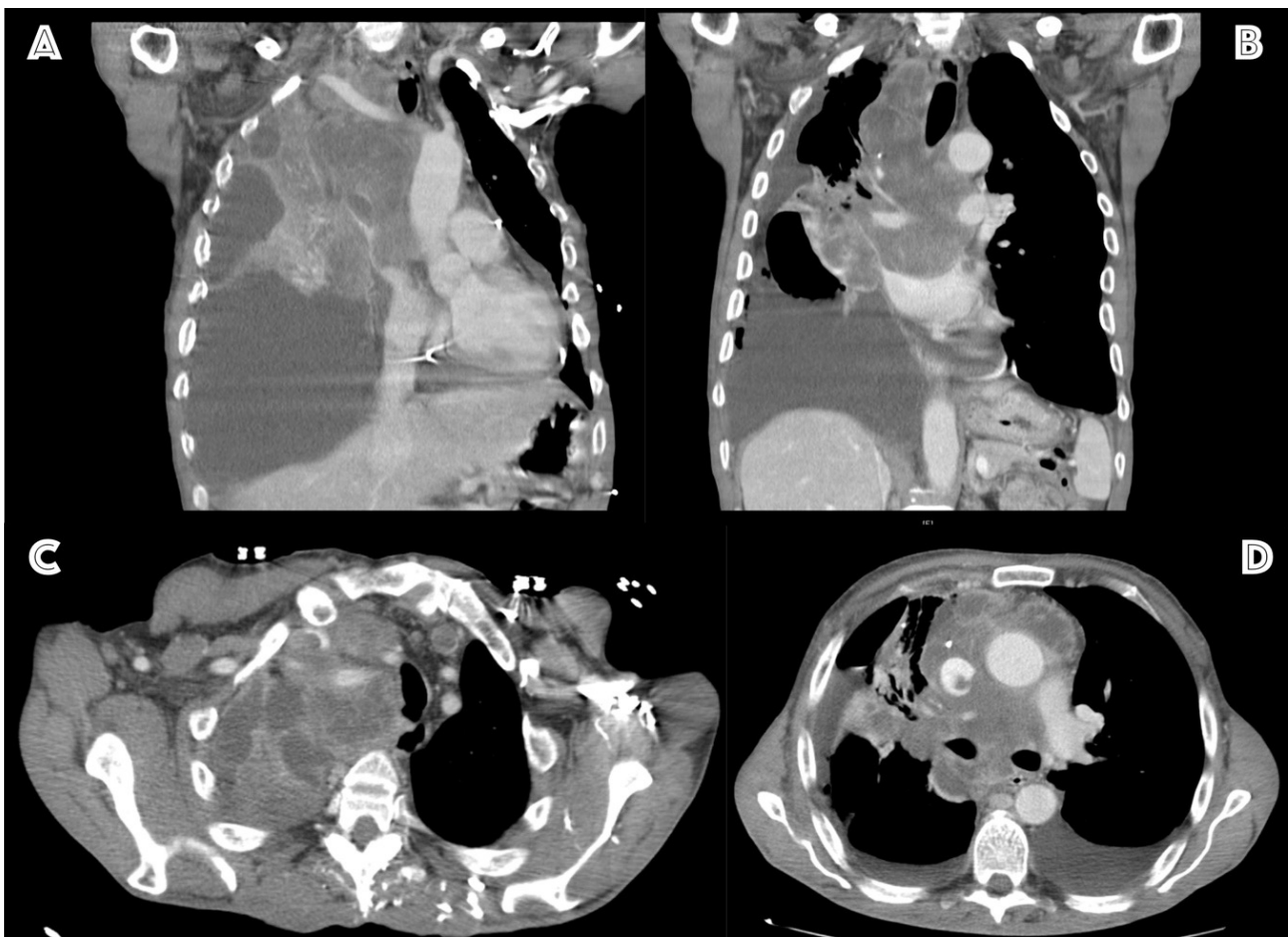


Figure 4. CT scan in emergency room, after pericardiocentesis, showing A) right pleural effusion and a large, heterogeneous and necrotic mediastinal mass, with deviation of the trachea as well as compression of the left atrium and an apparent plane of continuity with the pericardium (B, C and D).

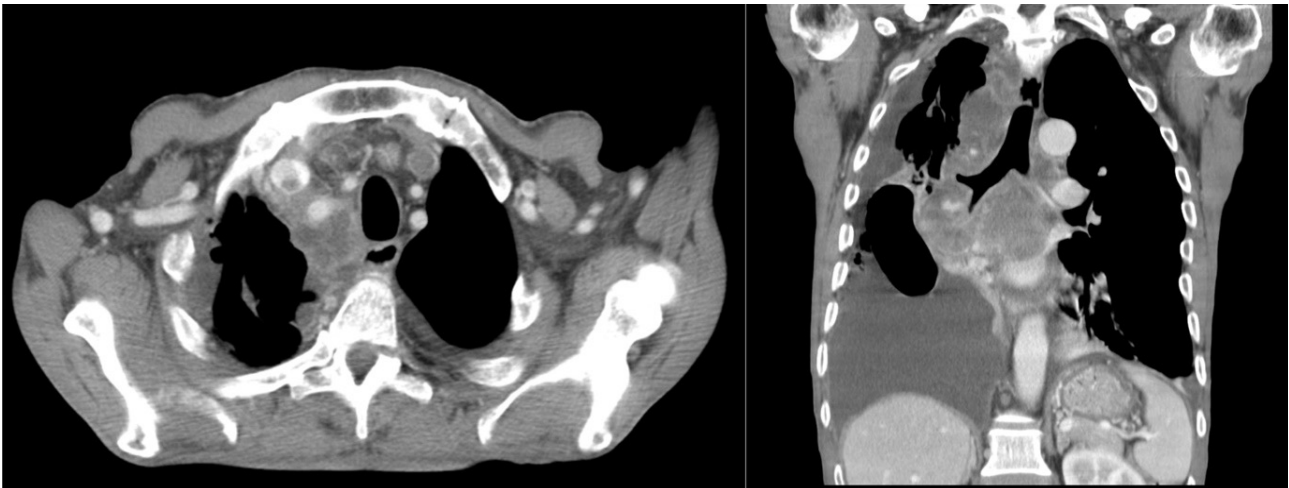


Figure 5. CT scan at discharge, showing great improvement.

peripheral blood cultures grew multi-sensitive *Streptococcus pneumoniae*. Cytological analysis of the pericardial fluid showed numerous polymorphonuclear neutrophils but did not reveal malignant cells. These results were consistent with pericardial infection. Antibiotic treatment was adjusted to amoxicillin and clavulanic acid, according to tested sensitivity. The pericardial drain and chest tube were removed after 2 days and the patient had progressive improvement in clinical status. After 2 weeks of targeted antibiotic therapy, he was able to achieve clinical status to undergo the first cycle of chemotherapy with cisplatin and etoposide and was discharged with an early scheduled pulmonology appointment (Fig. 5).

DISCUSSION

Despite therapeutic advances, small-cell lung cancer has a really poor prognosis. The use of radiotherapy may improve the survival of some patients, especially in life-threatening situations such as SVC syndrome, but the potential complications of radiation must always be considered. Radiation therapy-induced pericardial disease can manifest acutely or chronically^[3]. Mechanisms of pericardial infection include direct spread from lung, pleura, or mediastinum or hematogenous spread, and *Streptococcus* and *Staphylococcus* species are the most common responsible. This disorder is associated with a high mortality rate, usually due to cardiac tamponade as a complication^[2]. This patient's situation appears to be an exceptionally rare case of pericardial infection caused by what we believe to be a pericardial-mediastinal mass fistula, which developed after radiotherapy sensitization and necrosis of the adenopathic conglomerate and presented acutely as a STEMI. Pericardial effusion occurs in 5-15% of all neoplasms, with primary lung cancer being the most common cause^[4]. Furthermore, the most common cause of pericardial effusion in a patient with lung cancer is malignant pericardial effusion^[2], but this case presents a rarer combination of a patient with primary lung cancer who presents with a nonmalignant, infectious pericardial effusion caused by pneumococcus, as a complication of radiotherapy. Cases of metastatic

cardiac tamponade mimicking STEMI have been described^[5]. However, to the authors' knowledge, this is the first case report of cardiac tamponade due to a pericardial-mediastinal mass fistula presented as a STEMI.

CONCLUSIONS

This case highlights the importance of considering cardiac tamponade of any origin as a differential diagnosis in patients with lung cancer experiencing severe worsening of dyspnea and signs of heart failure. An integrated approach in the emergency room, as well as in the inpatient setting, is necessary, considering all signs, symptoms, and complementary diagnostic tests. A strong clinical suspicion and immediate approach is essential in patients presenting this life-threatening event.

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