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Concurrent pleural and pericardial effusions in advanced lung adenocarcinoma

Abstract

Lung adenocarcinoma is a common malignancy that often spreads to different organs, such as the pleura and pericardium. The concurrent presence of pleural and pericardial effusions often signifies an advanced stage of the disease. This case report delineates the presentation of a 71-year-old male diagnosed with advanced lung adenocarcinoma complicated by concurrent pleural and pericardial effusions. Diagnostic imaging and cytological analysis confirmed the diagnosis, guiding subsequent treatment. Pericardiocentesis and thoracentesis were initiated to alleviate symptoms and improve quality of life. The case underscores the complexities involved in managing advanced lung adenocarcinoma accompanied by pleural and pericardial involvement.

Palliat Med Pract

Keywords: pleural effusion, pericardial effusion, adenocarcinoma of lung

Introduction

Lung cancer is a prevalent malignancy with a considerable risk of mortality and the potential to metastasize to various organs [1]. The concurrent occurrence of pleural and pericardial effusions is more frequently associated with malignancy than pericardial effusions alone [2]. The following description pertains to a patient diagnosed with stage IVA non-small cell lung cancer, specifically adenocarcinoma, along with left pleural effusion and pericardial effusion.

Case presentation

A 71-year-old male presented to the Emergency Department complaining of progressively worsening shortness of breath over the past week, particularly notable in the last 3 days. His breathlessness was

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Palliative Medicine in Practice

DOI: 10.5603/pmp.99840

Received: 18.03.2024 Accepted: 30.04.2024 Early publication date: 30.04.2024

Table 1. Laboratory results of complete blood count and blood chemistry upon admission

Parameter	Results	Reference range
White blood cell count (× 10^9/L)	11.0	4.0–11.0
Haemoglobin (g/dL)	11.1	12.0–16.0
Platelet count (× 109/L)	338	150–400
Random blood glucose (mmol/L)	5.4	7.8–11.1
Aspartate transaminase (U/L)	23	< 38
Alanine transaminase (U/L)	16	< 41
Sodium (mmol/L)	136	136–145
Potassium (mmol/L)	4.4	3.5–5.1
Urea (mmol/L)	4.9	2.5–7.8
Creatinine (μmol/L)	54.8	44–78

constant and unaffected by activity or weather. He reported a week-long cough with thick white sputum containing blood, along with hoarseness persisting for the past 6 months. Despite a history of weight loss amounting to 6 kg over the last 3 months and a smoking habit of 12 cigarettes per day since adolescence, there were no signs of bleeding, fever, night sweats, or black stools. On physical examination, he appeared moderately unwell and malnourished, with a body mass index (BMI) of 18 kg/m^2, a respiratory rate of 24 breaths per minute, and SpO_2 at 99% with 3 liters per minute of supplemental oxygen. Clinical examination revealed notable findings, including a firm, non-tender left supraclavicular gland enlargement, decreased left chest expansion, and diminished breath sounds in the left basal lung, among others. Abdominal examination was unremarkable.

The complete blood count and blood chemistry at admission were within normal limits (Table 1). Thoracic multislice computed tomography (MSCT) with contrast at admission revealed a left lung mass in the left upper lobe, bilateral pulmonary nodules, bilateral lymphadenopathy, left pleural effusion, pericardial effusion, and aortic dilatation and atherosclerosis (Figure 1). Cytomorphological evaluation of pleural fluid on the second day of treatment revealed reddish-yellow fluid totaling 70 mL (in 2 specimens). The malignant cells consisted of groups of cells with glandular and papillary formations, coarse nuclear chromatin, irregular nuclear edges, sufficient cytoplasm with a mesothelial background, and the presence of lymphocytes and erythrocytes. Malignant cells indicative of adenocarcinoma were identified at the conclusion of the smear. Echocardiography on the second day of treatment concluded massive pericardial effusion, approximately 850 mL in volume, with signs of impending cardiac tamponade, impaired right ventricle (RV) diastolic filling due to the massive pericardial effusion (volume sekitar 8,560 mL), normal left ventricle (LV) systolic function [with an ejection fraction (EF) of 62.3% by biplane], normal RV systolic function, TAPSE of 2.3 cm, and global normokinetics. Based on the medical history, physical examination, laboratory, and other supportive tests, and the results of the consultation with the cardiology department, this patient was diagnosed with adenocarcinoma of the lung, T2aN3M1a stage IVA, ECOG 3, with left pleural effusion and pericardial effusion secondary to malignancy.

On the second day of treatment, the patient underwent thoracentesis due to indications of right-sided pleural effusion, yielding 900 mL of cloudy yellow fluid, which was subsequently analyzed biochemically. The analysis resulted in classification as an exudate due to its yellow purulent nature, high protein content, high cell count, and elevated lactate dehydrogenase levels. On the third day of treatment, the patient was diagnosed with lung adenocarcinoma based on the results of pleural fluid cytology. The patient was referred to the cardiology department for management. Pericardiocentesis was performed with a single puncture and a drain was left in place, allowing for continuous drainage. For four days, a total of 850 mL of hemorrhagic fluid was removed. A second pericardiocentesis on the sixth day yielded an additional 109 mL of hemorrhagic fluid. Due to recurring effusions, it was decided to use a Robinson drain during a second thoracentesis performed on the twelfth day, successfully sparing the patient from further procedures by extracting 1,700 mL of cloudy

yellow fluid. Samples of the pleural effusion were then examined for EGFR mutations. Following the second thoracentesis, the patient experienced reduced shortness of breath. At the next visit, this patient was scheduled for chemotherapy. EGFR testing revealed no mutations. The patient was prepared for chemotherapy with a regimen consisting of carboplatin 385.9 mg on day one and pemetrexed 747 mg on days 1 and 8.

Discussion

Lung tumors, primarily categorized into small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC), constitute 95% of all lung cancers. This classification assists in treatment selection and prognosis prediction. NSCLC, representing 85% of cases, includes adenocarcinoma, squamous cell carcinoma, and large cell undifferentiated carcinoma subtypes [3]. The revised classification now divides lung adenocarcinoma into three distinct groups: adenocarcinoma *in situ* (AIS), minimally invasive adenocarcinoma (MIA), and invasive adenocarcinoma. The term bronchoalveolar cell carcinoma (BAC) is no longer included [4].

Pleural metastases are characterized by direct invasion as the main feature, whereas pericardial metastases primarily appear as tumor cells floating within the cavity or as lymphatic emboli rather than by direct invasion of the underlying fibrous tissue [5]. Previous studies have shown that cytology is more accurate than histopathology in diagnosing pericardial effusion as pericardial metastases [6]. This is in contrast to pleural effusions, where pleural fluid cytology has a diagnostic yield of 60% for carcinoma, and medical thoracoscopy exceeds 93% for biopsy specimens [7]. The absence of mutations identified in a diagnostic sample obtained at initial presentation may change as the tumor progresses or in response to chemotherapy [8]. The initial diagnostic workup included MSCT with contrast, which revealed characteristic findings of advanced NSCLC, including a left lung mass, bilateral pulmonary nodules, and bilateral lymphadenopathy, along with left pleural and pericardial effusions. Cytomorphological evaluation of pleural fluid confirmed the presence of malignant cells indicative of adenocarcinoma, supporting the diagnosis. In the present case, EGFR testing was performed, but no mutations were identified in the diagnostic sample obtained at the initial presentation.

Pericardial effusion has emerged as an independent prognostic factor for mortality in lung cancer [9]. Among individuals diagnosed with NSCLC, patients with mild pericardial effusion typically exhibit better survival outcomes compared to those with significant

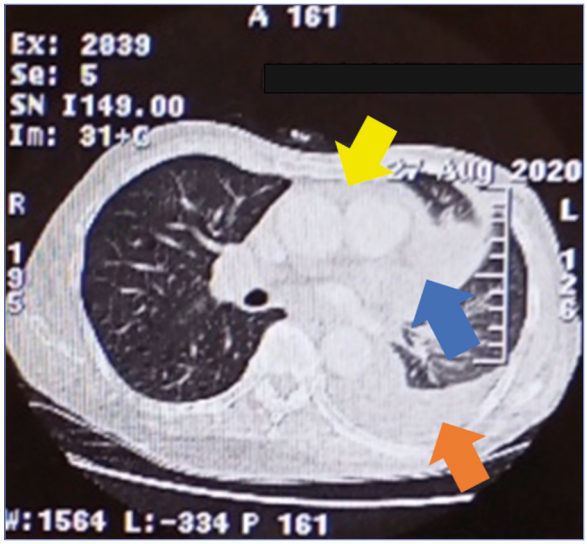

Figure 1. Thoracic multislice computed tomography (MSCT) with contrast at admission. The blue arrow indicates a left lung mass in the left upper lobe, the brown arrow indicates left pleural effusion, and the yellow arrow indicates pericardial effusion

pericardial effusion [10]. Furthermore, recent investigations have linked concurrent pleural effusion, positive cytology, and NSCLC to unfavorable prognostic outcomes through multivariate Cox regression analysis [11]. Recent studies have also suggested that local chemotherapy, with or without systemic chemotherapy, in conjunction with pericardiocentesis, may offer superior efficacy compared to other treatment modalities [12].

In managing advanced or metastatic NSCLC, the NCCN tailors treatment plans based on patient performance. Those with performance statuses of 0–1 receive category 1 therapies, like pembrolizumab combos. Performance status (PS) 2 patients are directed to carboplatin/pemetrexed regimens. PS 3–4 prioritize supportive care. Pemetrexed is favored in maintenance, alongside category 1 choices such as bevacizumab, pemetrexed, or pembrolizumab combos [13]. Despite the presence of complications and concurrent medical conditions, elderly individuals with a favorable Eastern Cooperative Oncology Group performance status (ECOG PS) frequently have opportunities to continue chemotherapy. When considering treatments for elderly patients, preference is given to medications with minimal cardiovascular and renal toxicity, as well as those lacking significant adverse effects or notable drug interactions [14]. Theoretically, the combination of pemetrexed and carboplatin holds promise as an optimal regimen for elderly patients

with advanced non-squamous NSCLC. Notably, there have been no significant disparities observed in the pharmacokinetics of pemetrexed across age groups ranging from 26 to 80 years [15].

The ECOG PS score of the study patient stands at 3, denoting the capability to execute only limited self-care activities. The treatment approach emphasizes delivering comprehensive supportive care meticulously customized to address their individual condition and requirements. Acknowledging the obstacles presented by their performance status, the authors have elected to pursue a treatment protocol incorporating a combination of chemotherapy with carboplatin and pemetrexed. Additionally, it is imperative to engage in discussions regarding therapeutic options specific to a given country and substantiate treatment choices within the framework of available resources and healthcare norms. Subsequent research endeavors could explore the efficacy of varied treatment regimens and their ramifications on patient outcomes.

Conclusions

Concurrent pleural and pericardial effusions in advanced lung adenocarcinoma pose diagnostic and therapeutic challenges. The present case underscores the importance of a comprehensive diagnostic approach, including cytological analysis, imaging modalities, and molecular testing, in guiding appropriate management strategies. Early recognition and intervention, such as pericardiocentesis and systemic chemotherapy, are crucial for optimizing patient outcomes and improving quality of life.

Article information and declaration

Acknowledgments
The authors would like to express their sincere gratitude to the Department of Internal Medicine, Faculty of Medicine, Hasanuddin University, for their unwavering support, encouragement, and insightful discussions that greatly enriched the review process of this case report.

Author contributions
The authors have contributed equally.

Conflict of interest
The authors declare that no conflict of interest.

Ethics statement
The patient's relative permitted the authors to publish the manuscript and signed the informed consent form.

Funding
None.

Supplementary material
None.

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