Critical Management of Atelectasis ec Adenomous Cell Carcinoma of the Right Lung with Pleural Effusion: A Case Report
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1. Introduction
Atelectasis is the loss of lung volume, either a part or all of a lung, with or without mediastinal shift. This is in contrast to consolidation, where the lung volume is normal. In clinical practice, there is often a combination of both.1 Massive pleural effusion occurs in association with malignancy, as evidenced by the discovery of malignant cells on pleural fluid cytology examination or pleural biopsy. Pleural effusion associated with malignant disease.2–4

Although there has been no epidemiological research on massive pleural effusion, its incidence can be estimated based on existing data, namely around 15% of all malignant diseases.5 Massive pleural effusion can be caused by almost all types of malignancy. Almost a third of cases of massive pleural effusion are caused by lung cancer.6 Based on the type of lung cancer cell, non-small cell carcinoma lung cancer is the most common cause of pleural effusion. massive, the proportion is 40% adenocarcinoma, 23% squamous cell carcinoma, and only 17.6% small cell carcinoma.7

This is probably because the largest number of lung cancer cases is small cell carcinoma, around 75% of all lung cancer cases. Other researchers found that 50-60% of massive pleural effusions are caused by metastases of lung and breast tumors in the pleura, 25% are caused by other malignancies such as lymphoma, cancer of the gastrointestinal and genitourinary systems, and 7-15% have unknown primary tumors.8 Around 50-60% of massive pleural effusions were caused by metastases of lung and
breast tumors in the pleura, 25% were caused by other malignancies such as lymphoma, cancer of the gastrointestinal and genitourinary systems, and 7-15% had unknown primary tumors. 

According to a study of critically ill lung cancer patients by Adam and Soubani, the main causes for admission to the medical ICU are acute respiratory failure (49%), cardiovascular problems (25%), sepsis (8%), and neurologic impairment (5%). In Western countries, lung cancer is the leading cause of death, and 8-15% of cancer patients require treatment in an intensive care unit (ICU). A variety of factors determine the prognosis of ICU cancer patients. These, caused by acute physiological disorders, require intensive care but not the underlying malignancy, while survival after treatment is related to the severity of the underlying neoplastic disease.

2. Case Presentation

A 56-year-old woman presented to the Emergency Department with complaints of increased shortness of breath for the past three days, which worsened with activity and coughing. She had a history of shortness of breath five months ago. She also reported an increase in white sputum production for the past seven days, with intermittent episodes of productive cough for the past five months. The patient had been experiencing stabbing back pain for the past five months. There was no fever or history of fever. No coughing up of blood was reported. There was no night sweats. The patient's appetite has decreased over the past month. She had also experienced a weight loss of 12 kg (from 55 kg to 43 kg) over the past five months and had sought treatment at a previous hospital. There was no nausea, vomiting, or complaints related to bowel movements or urination.

In the previous hospital, a chest X-ray and sputum examination were performed. The patient received anti-tuberculosis treatment in April. After four months of taking anti-tuberculosis treatment, the symptoms did not improve. The patient sought treatment at other hospitals one month ago, where it was found that there was fluid in the pleural cavity. Thoracocentesis was performed on the right chest wall, and 800 cc of yellow fluid was drained.

The patient appears to be moderately ill. Complement, blood pressure is 112/81 mmHg, heart rate is 126 beats per minute, temperature is 36.3°C, respiratory rate is 24 breaths per minute, and oxygen saturation is 99% with a nasal cannula at 3 liters per minute. The patient weighs 43 kg, has a height of 155 cm, and has a body mass index (BMI) of 18.3 kg/m².

Lungs examination form inspection, the right chest wall appears more convex, with decreased movement compared to the left chest wall; percussion: dullness on the right, resonance on the left, palpation decreased vocal fremitus on the right and auscultation: Diminished or absent breath sounds on the right, bronchovesicular breath sounds on the left.

Chest X-ray examination results with the conclusion of massive pleural effusion dextra. Laboratory results at the beginning of admission were obtained: leukocytosis 12,630, hyponatremia 131 mmol / L, and hypochloridemia 91 mmol / L. The results of gas analysis through NK 3 lpm pH 7.542 PCO₂: 39 PO₂: 148.1, HCO₃⁻: 33.8 BE: 11.1 SO₂%: 99.9% with the impression of metabolic alkalosis. The patient was diagnosed with pleural effusion extra caused by suspected right lung cancer unknown cell type TxN3M1A (pleural) stage IVA PS ECOG I DD/pleural effusion dextra is caused by lung metastasis. The patient was managed with IVFD NaCl 0.9% 8 hours/day, N. Acetylcysteine 2x200 mg po, paracetamol 4x500 mg po, anti-tuberculosis agent continued and planned bronchoscopy in general anesthesia.

On the second day of treatment, an ultrasound examination was performed, revealing a massive right pleural effusion. A thoracentesis procedure was performed, resulting in the removal of 1300 cc of serohemorrhagic fluid. The procedure was stopped due to the patient coughing. The analysis of the pleural fluid showed a chronic exudative process. On the third day of treatment, a thoracic ultrasound was performed, showing right pleural effusion with a marker at the sixth intercostal space in the right
midclavicular line. Another thoracentesis was performed, and 500 cc of hemorrhagic fluid was drained. Oral anticoagulant therapy was stopped. Laboratory results showed hypoalbuminemia with a level of 3.1. The patient was advised to follow a diet rich in protein and consume four white eggs.

Bronchoscopy was performed under general anesthesia (GA), and a pigtail catheter was inserted with ICU backup. The bronchoscopy results showed an infiltrative mass in the left upper lobe (LUL) and a blunt right carina (T3N1M0). Post-bronchoscopy, the patient’s condition became unstable, and he was transferred to the ICU for intensive care and mechanical ventilation. Upon admission to the ICU, the patient was placed on a ventilator. Consciousness: under drug influence, Blood pressure: 120/60 mmHg, Heart rate: 112 beats per minute, Mean arterial pressure (MAP): 94 mmHg, Respiratory: Oxygen saturation (SpO₂): 100% on ventilator, Temperature: 36.0°C. The patient received ceftriaxone 2x1 gr, Omeprazole 2x40 mg, tranexamic acid 3x1 gr, vitamin K 3x10 mg, ketorolac 3x30 mg, and paracetamol 1 gr for therapy.

One day after bronchoscopy, a repeat thoracic X-ray was performed with the impression of atelectasis in the right lung, and bronchoscopy and bronchial toilet were planned. On the fifth day, a bronchoscopy was performed, and an infiltrated mass was seen, followed by a bronchial toilet.

3. Discussion

In this case, a 56-year-old female patient complained of increasing shortness of breath since three days ago, not decreasing, increasing with activity and coughing. The previous history of shortness of breath existed five months ago. Complaints of tightness arise due to the accumulation of fluid in the pleural cavity, which will provide pathological compression to the lungs so that their expansion is disrupted, and additional sounds do not accompany the tightness because the bronchi remain normal. The more fluid buildup, the more severe the tightness becomes. Coughing with white phlegm has increased in the past seven days. History of cough with phlegm since five months ago. It comes and goes. There is no coughing up of blood. There was no history of bloody coughing. Coughing with pleural effusion may be caused by stimulation of the pleura due to excessive pleural fluid, inflammatory process, or mass in the lungs. Patients also complain of a decrease in appetite and weight for no reason since coughing appeared. Weight loss in these patients is very common in lung cancer patients. Forty to 60% of lung cancer patients experience this complaint of weight loss of 5%, which results in poor outcomes.

From the physical examination, it was found that the right chest wall was more convex and movement was lagging, fremitus decreased, percussion was dull, respiratory sounds decreased until they disappeared, and pushing of the mediastinum to the healthy side could be seen or felt in the trachea. All abnormalities found in the patient were caused by fluid accumulation. in the right pleural cavity. There are several theories about the emergence of pleural effusion in neoplasms, namely: the accumulation of tumor cells will increase the permeability of the pleura to water and protein, the presence of a tumor mass results in blockage of the flow of veins and lymph vessels so that the pleural cavity fails to move fluid and protein. The presence of a tumor makes it easier for infections to occur, and subsequently, hypoproteinemia occurs.12

The results of a chest X-ray examination concluded that there was a massive right pleural effusion. Laboratory results at initial admission showed leukocytosis 12,630, hyponatremia 131 mmol/L, and hypochloremia 91 mmol/L. Results of gas analysis via NK 3 lpm pH 7.542 PCO₂: 39 PO₂: 148.1, HCO₃⁻: 33.8 BE: 11.1 SO₂%: 99.9% with the impression of metabolic alkalosis. The patient underwent thoracentesis, and a serious hemorrhagic fluid came out. If it is slightly reddish, this can occur due to trauma, pulmonary infarction, or malignancy. The patient underwent pleural fluid cytology with the result of adenocarcinoma. To confirm the suspicion of pleural effusion caused by right lung cancer, this patient underwent bronchoscopy. Bronchoscopy
results showed an infiltrative mass in the right bronchus and a blunt second carina. The main management for this patient is thoracentesis therapy, Water shield drainage installation, pleurodesis, and causal treatment. Apart from that, this patient was also given several other supporting therapies, which were adjusted to the clinical manifestations that appeared. A posteroanterior (PA) chest X-ray is needed to support the suspicion of pleural effusion on physical examination, and if the volume of fluid is not too large, a lateral chest X-ray is needed to determine the location of the fluid more precisely. The average lung volume in most cases is 500-2000ml. The etiology of malignancy must be considered if the volume of pleural effusion is very large and is categorized as massive or on a chest X-ray. Even though the amount of fluid is massive, the mediastinal pressure is not visible. (marker) location for thoracentesis and pleural biopsy.

The definitive diagnosis is by finding malignant cells in the pleural fluid (cytology) or pleural tissue (pathology histology). The amount of pleural fluid required to obtain malignant cells and accurate results still vary. The accuracy of these cytology results can be improved by performing repeated thoracentesis. Bronchoscopy should be performed after maximum efforts to reduce the volume of pleural fluid have been made so that intrabronchial observation can be maximized and is not disturbed by compression obstruction due to massive pleural effusion pressure.

The pathophysiology is multifactorial: it can be obstructive, non-obstructive, or both. Most cases are likely due to multiple factors, with prolonged immobility and infection being the most common contributors. Atelectasis will affect systemic oxygenation significantly and lead to loss of adequate ventilation to the perfused lung units. It was first identified during general anesthesia, and its effects were reversed by passive hyperinflation.

There are many strategies to consider when trying to minimize atelectasis during artificial ventilation in critical care patients. Ventilator settings with CPAP settings are useful for the management of spontaneously breathing patients and typically can be used in patients with non-obstructive atelectasis who cannot breathe deeply. The aim is to open collapsed alveoli to reduce shunts and improve ventilation-perfusion homogeneity, thereby reversing hypoxemia. The level of PEEP required will depend on the clinical condition of each patient. Airway pressure above PEEP is responsible for alveolar recruitment. PEEP will then prevent recurrence. PEEP has a protective role by attenuating surfactant depletion and reducing shear stress, parenchymal injury, and cytokine release. An open-lung strategy that uses a low tidal volume (6-8 ml/kg), limits pressure (high tidal pressure, 35 cm H₂O), and sets PEEP above the lower inflection point on the pressure-volume curve is suggested to reduce mortality, ICU length of stay, and ventilated days.

4. Conclusion
Pleural effusion with lung tumor and atelectasis are common cases in critical care. The management provided can help in reducing patient morbidity.

5. References


