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Case Report

Large Pulmonary Bullae, Resulting from Tuberculosis, in the Context of Extensive Pneumothorax Caused by a Penetrating Chest Wound

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ABSTRACT

Pulmonary bullae typically occur either idiopathically or in the context of chronic obstructive pulmonary disease and pulmonary infections. Clinical manifestations of pulmonary bullae include cough, shortness of breath, and chest pain. In some cases, they may be asymptomatic. Differentiating between pneumothorax and pulmonary bullae can be challenging when they coexist. Therefore, obtaining a detailed patient history, conducting a physical examination, performing laboratory tests, and utilizing radiology studies are essential diagnostic tools that should be employed simultaneously. In this case report, we present a patient who developed a wide pneumothorax due to a penetrating chest wound caused by a knife. Initially, the large lung cavity, which had already formed due to tuberculosis, was misdiagnosed as a loculated pneumothorax.

Introduction

Pulmonary bullae are air spaces within the lung with a diameter larger than one centimeter. Bulla may occur singly or in multiples and tend to get larger over time [1-3]. Currently, the only available lung bullae treatment is open surgical removal (thoracotomy) or minimally invasive removal using video-assisted thoracoscopic surgery [1]. tuberculosis is one of the rare causes of pulmonary bullae [4]. Pulmonary blebs are rarely confused with pneumothorax, but they can be challenging to distinguish if they are huge or co-occur with pneumothorax [4-5].

Case Report

The patient, a 20-year-old homeless man, suffered penetrating chest trauma with a knife three months ago due to a street fight. The injury occurred in the 4th and 5th intercostal space on the right side of the chest in the mid-axillary line. Due to financial constraints, the patient did not seek medical care and lived with a sucking chest wound for three months without any treatment. Finally, severe weakness and lethargy transferred the patient to Khatam Al Anbia Hospital in Zahedan by EMS after a passerby called for help. Upon arrival, the patient was fully conscious with a Glasgow Coma Scale (GCS) 15. Despite being pale and emaciated, the patient reported no recent weight loss. There were no signs of respiratory distress or retraction of the intercostal or suprasternal areas. Symmetrical chest wall movements were observed.

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A significant volume of purulent secretions came out of the chest wound. The patient did not disclose any medical history or previous illnesses. But he stated that he is addicted to amphetamine and opium and uses these substances to an unspecified amount and irregularly. In the initial examination, BP= 110/70, HR= 89/min, RR= 18/min, Spo_2= 96% in room air, and T= 37 °C. The respiratory sound was reduced on the right side of the lung, and a short and diffuse exhalation wheeze could be heard on the left side. Chest X-ray (Figure 1) showed a large right pneumothorax and upper bullae and diffuse chest consolidation. According to the radiologist's interpretation of the chest radiograph, the right upper bulla was identified as an air cyst resulting from a loculated pneumothorax. Additionally, the diffuse lung infiltrations observed were determined to be indicative of bacterial pneumonia.

A spiral chest CT was conducted for a more detailed examination (Figure 2). The radiologist's report on the lung CT revealed the presence of severe right pneumothorax and hydrothorax with a fistula to the skin. Large posterior traumatic cysts were observed in the right upper lobe (RUL) and smaller cysts in the left lung, indicating loculated pneumothorax. Additionally, ground glass nodules were identified in the left lung, suggesting bronchopneumonia.

As for the patient's initial test results, they are as follows:

WBC= $9/7\times10^3$ /mm, Neut= %96/8, RBC= 4/1 mil/mm, HB= 12/5 g/dl, HCT= %39/6, PLT= 255×1000, PT= 14/sec, PTT= 33/sec, INR= 1/1, BS= 108 mg/dl, BUN= 18 mg/dl, CR= 0/5 mg/dl, K= 4/8 meq/l, Na= 137 meq/l, Alb= 3/1 g/dl, P= 2/5 mg/dl, Ca= 8/3 mg/dl, Mg= 1/8 mg/dl, CRP= 1+, ESR= 18 mm, ABG (PH= 7/43, $PaCO_2$= 37/1, HCO_3= 22/3, BE= -1/8, PaO_2= 68/8, O_2Sat= 94/3)

Based on the diagnosis of severe pneumonia and the patient's addiction history, the following treatment regimen was initiated: Meropenem 1g TDS, Vancomycin 1g BID, Amikacin 1.5g daily, N-acetylcysteine 600mg BID, Pantoprazole 40mg daily and Methadone 5mg QID. Due to the severity of the condition, the patient was transferred to the intensive care unit for closer monitoring and specialized care. Additionally, a surgical consultation was requested for the patient to evaluate further and determine if any surgical intervention was necessary. Based on the radiologist's report of the chest X-ray and CT and a large volume of purulent drainage from the penetrating chest wound, the surgeon decided to proceed with a thoracotomy and chest tube placement for the patient. The surgical procedure involved a posterior lateral thoracotomy.

For culture, two separate samples were taken from the purulent lung secretions during the thoracotomy. Following this, the surgical team thoroughly washed the thorax with normal saline and completely removed the pus. Two chest tubes were then inserted to facilitate the drainage of air and purulent secretions from the lung cavity and thoracic space (Figure 3).

The patient's drug treatment continued for 72 hours with the mentioned antibiotics, and the patient's laboratory tests were measured daily. The patient's white blood cell count was increasing. So that in the first 72 hours after hospitalization, WBC= 14.8×1000^3. Therefore, we thought the organisms causing the infection were probably resistant to the prescribed antibiotics, and we empirically changed the patient's antibiotic treatment to piperacillin-tazobactam 3.375 QID and levofloxacin 750mg daily. The results of the lung secretions culture and the patient's blood culture were delivered by the laboratory after 72 hours, and the results of both cultures were negative. Due to the exudate secretion from the chest tube, the re-culture of the lung secretions and the re-culture of blood were sent on two occasions, and the results of the re-culture were also reported as negative. Therefore, it was suspected that the lung cavity was caused by tuberculosis, which delayed diagnosis due to the pneumothorax that occurred at the same time. Thus, simultaneous samples of pharyngeal secretions and chest tube secretions were sent for AFB culture and polymerase chain reaction (PCR) for Tuberculosis (TB), and the results of both cases were reported to be positive for tuberculosis. Therefore, anti-tuberculosis drugs were started for the patient. After 72 hours, the volume of secretions exits from the chest tubes decreased significantly, and the patient's WBC decreased to 5.4×1000^3. Therefore, the surgeon removed one of the patient's chest tubes, and the patient was transferred to the surgery department. Two days later, the patient suffered respiratory distress and decreased arterial blood oxygen saturation in the surgery department. Therefore, a chest x-ray was performed for the patient, which showed an increased pneumothorax amount (Figure 4). Due to the increasing severity of shortness of breath, the patient was intubated, but unfortunately, the treatment measures to improve the patient's respiratory condition were ineffective. The patient suffered cardio-respiratory arrest, did not respond to cardiopulmonary resuscitation, and died.

Figure1- Chest radiograph of the patient in the standing position showing a wide pneumothorax on the right side and a large air cyst measuring 54 x 30 in the upper lobe of the right lung with diffuse bilateral lung consolidation

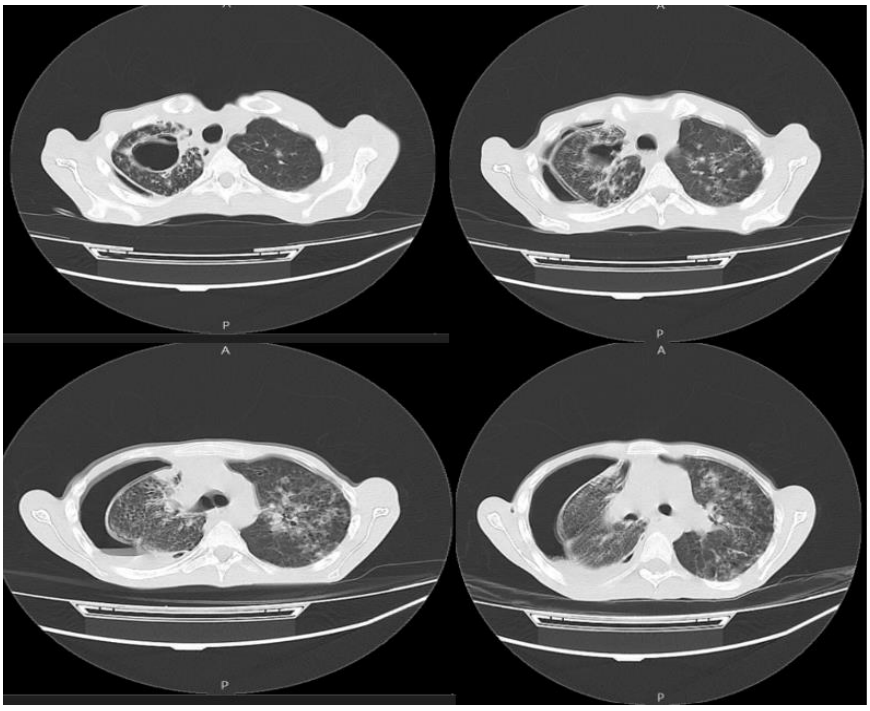

Figure 2- A spiral CT scan of the lung showing right-sided pneumothorax with a large air cyst with a maximum dimension of 54x30 mm on the right side and a maximum dimension of 19 mm on the left lung showing loculated pneumothorax and central acinar ground glass lesions with trachea mucus plug presenting bronchopneumonia

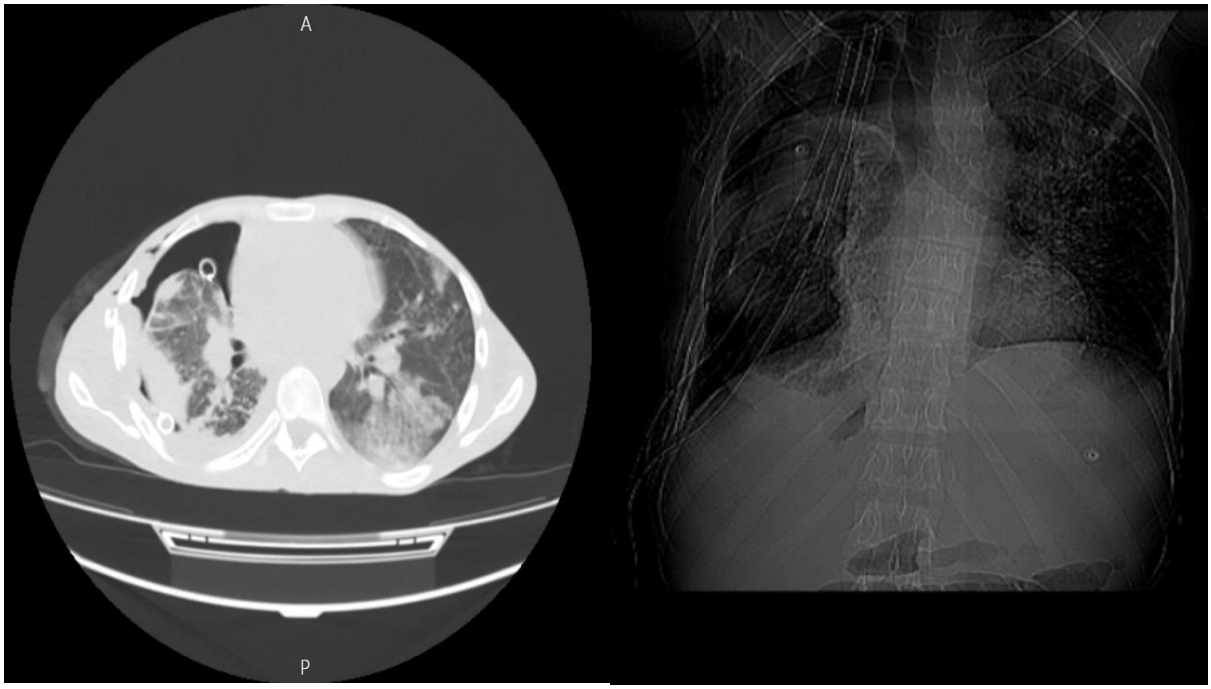

Figure 3: chest X-ray and CT after insertion of two chest tubes

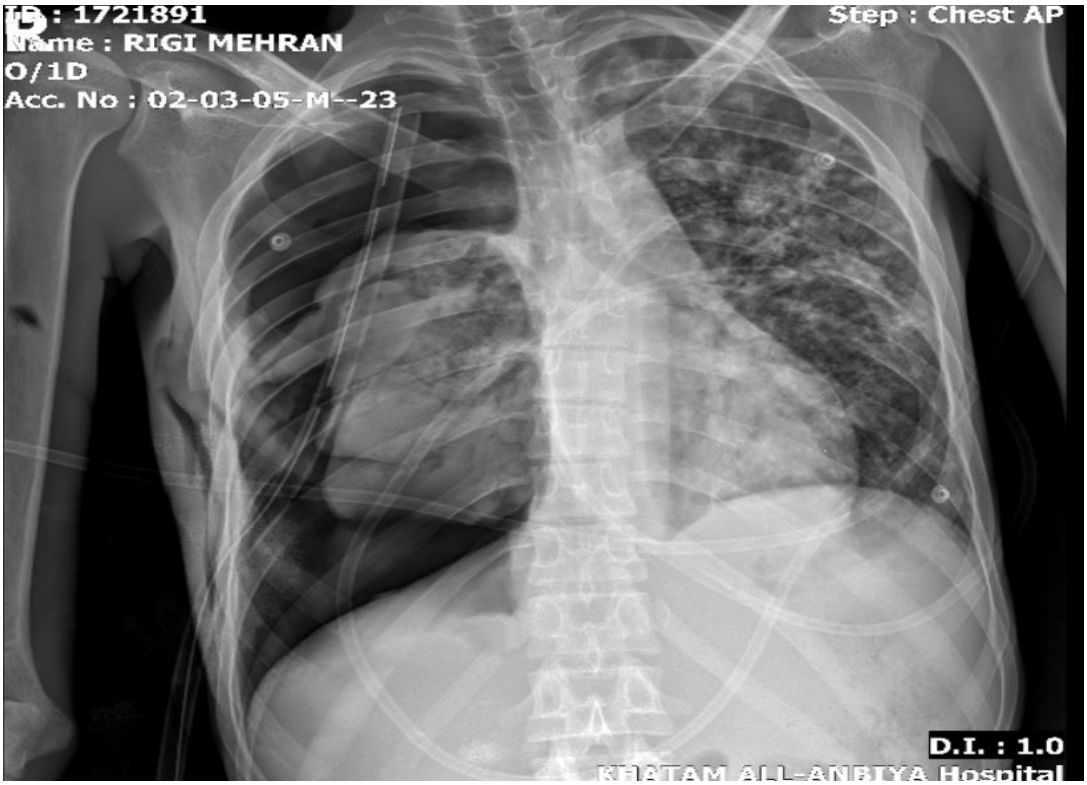

Figure 4- Chest radiograph showing the increase in the volume of the right pneumothorax caused by the manipulation of the lung cavity

Discussion

The simultaneous presence of two diseases in the same patient or organ creates the most exciting and challenging problems in diagnosis and treatment [6]. Large pulmonary bullae, tension pneumothorax, and atypical (cluster) pneumothorax can cause similar symptoms and radiological appearance and are difficult to differentiate. Therefore, when you see a patient's chest radiograph with large lucent areas, you should review the clinical history, physical examination, and required laboratory tests in more detail and obsessively [7]. Radiologically, bullae appear as radiolucent avascular areas with thin curved walls that are usually less than 1 mm thick. Therefore, they may sometimes not be visible on a chest radiograph, making them difficult to detect and leading to a misdiagnosis as pneumothorax. When visible, the bullae wall may be misinterpreted as a pleural line and mistaken for a pneumothorax on a chest radiograph [8]. Pulmonary bullae are mainly located inside the lung parenchyma and subpleural and mostly occur in the upper lobes of both lungs. Observing and differentiating them from pneumothorax is essential [9]. Because placing a chest tube inside the bullae may increase the amount of pneumothorax, hemothorax, shock, and, finally, the patient's death [7].

Conclusion

It is necessary to consider other causative factors, such as chronic lung infections, and perform the required diagnostic tests in case of simultaneous observation of lung cavity and pneumothorax caused by penetrating chest wounds. Also, avoid placing the chest tube inside the cavity. Because it leads to an increase in the volume of pneumothorax, respiratory and cardiac dysfunction, and ultimately results in the patient's death.

Ethical Considerations

The Zahedan University of Medical Sciences research ethics committee approved the present case report with the ethics code of IR.ZAUMS.REC.1402.466.

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