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Case Report

Diving into Diagnostic Complexity: A Case Study of Spontaneous Hemothorax

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ABSTRACT

Hemothorax, a condition characterized by blood accumulation in the pleural space, primarily results from trauma, affecting around 300,000 individuals annually in the United States. Spontaneous cases, although rare, pose diagnostic challenges due to diverse etiologies such as coagulation disorders, vascular anomalies, and neoplastic diseases. Diagnostic modalities like computed tomography, chest X-ray, and ultrasound play a crucial role in identification. A 29-year-old female with multiple sclerosis presented with severe chest symptoms, leading to pleural effusion requiring chest tube insertion. Despite inconclusive rheumatologic tests, evaluations excluded malignancies and thromboembolic events, enabling transfusions and supportive care. Global cases underscore varied causes of spontaneous hemothorax, with management strategies emphasizing interdisciplinary care. While certain conditions were ruled out, unresolved rheumatologic concerns persisted post-discharge, highlighting the need for further research to enhance diagnosis and management of spontaneous hemothorax.

Introduction

Hemothorax is commonly defined as the accumulation of blood in the pleural space or an increase in pleural fluid hematocrit above 50%. Approximately 300,000 individuals in the United States are affected by this condition annually, with most cases resulting from blunt trauma or penetrating chest injuries. However, in rare cases, hemothorax may occur spontaneously or iatrogenically [1].

Spontaneous hemothorax is a rare and unusual phenomenon that occurs in four main areas: coagulation disorders, vascular abnormalities, neoplastic diseases and cancers, and unknown and diverse causes [2]. Anticoagulant therapy with warfarin, heparin, and enoxaparin following thromboembolism, altered vascular function due to aortic dissection in individuals with uncontrolled hypertension or atherosclerosis, genetic diseases such as Ehlers-Danlos syndrome and Rendu-Osler-Weber syndrome, metastatic tumors in the chest cavity, inflammation, infection, and neurofibromatosis can all lead to spontaneous hemothorax [3-4].

Hemothorax typically affects major arteries including the thoracic aorta, intercostal arteries, and internal mammary artery, and ultimately can lead to compressive hemothorax and death [1]. This condition also reduces venous return, leading to decreased preload and hemodynamic instability [5]. Additionally, it can cause lung collapse due to diaphragmatic shift upwards [6]. According to studies, the incidence of infection is higher in individuals recovering from hemothorax compared to others, and the likelihood of infectious diseases occurring in these patients increases [1,7].

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For the diagnosis of hemothorax, CT, CX-ray, ultrasound sonography, FAST (Focused Assessment with Sonography for Trauma), and EFAST (Extended Focused Assessment with Sonography for Trauma) are used [1].

Case Report

A 29-year-old female patient began experiencing shortness of breath and mild chest pain on November 15th. The pain gradually increased, accompanied by nausea and frequent vomiting (14 episodes). Following these symptoms, the patient visited a local clinic and opted for home treatment. On November 16th, the patient experienced severe chest, shoulder, and back pain, along with limb stiffness, prompting her to contact emergency services. Suspecting cardiac issues, she was transferred to Hazrat Rasoul Akram Educational, Research, and Treatment Center. The patient has a history of multiple sclerosis dating back 11 years, with the last attack occurring five years ago. Ten months ago, she voluntarily discontinued Rebif and Tecfidera medications and had not experienced another MS attack since then. She denied any history of accidents or trauma. She had a recent episode of cold with improved symptoms within the past month, characterized by productive coughs only outdoors. The patient had a history of depression and had been treated with citalopram. Vital signs were measured upon admission to the hospital, with the results outlined in (Table 1).

Table 1- patient's vital sign upon admission to the to Hazrat Rasoul Akram Educational, Research, and Treatment Center

Vital signs	
PR (beat/mean)	120
BP (mmHg)	143/87
SPO2	87%
T (Celsius)	37
RR (/mean)	24

BP: Blood Pressure, SPO2: Saturation of Peripheral Oxygen, T: Temperature, RR: Respiratory Rate, PR: Pulse Rate

The patient was fully awake and alert but unable to speak due to shortness of breath. Decreased breath sounds were heard bilaterally, with more prominent reduction on the left lung. Cardiac auscultation was difficult, but a normal rhythm was reported. Abdominal examination was normal, with slight tenderness in the left upper quadrant (LUQ). Eye examination and facial movements were normal. The only significant finding in our assessments was the decreased lung sounds and shortness of breath, which guided therapeutic interventions accordingly.

Therapeutic Interventions

To assess the internal view of the chest, an emergency CX-ray was performed, revealing a significant amount of fluid in both sides (Figure 1). For a more detailed examination, a spiral CT scan of the chest was conducted, revealing moderate right-sided pleural effusion along with adjacent lung consolidation, as well as severe left-sided pleural effusion with consolidation of the adjacent lung and a shift of the heart and mediastinum to the right (Figure 2). Thromboembolic lesions in the pulmonary arteries and malignant lesions in the lungs were not observed. Due to the larger volume of accumulated fluid on the left side, an emergency chest tube was inserted on the left side. Within the first 3 hours, 600 cc of blood was drained, followed by 450 cc after 6 hours. Considering the patient's critical condition, she was transferred to the special surgical care unit. During the transfer, the patient's vital signs were stable, and her shortness of breath had significantly reduced. Within the first 36 hours after chest tube placement, a total of 1750 cc of blood was drained, with only air drainage observed in the following 48 hours. Given the absence of trauma history, normal appearance of pulmonary vessels, and no evidence of metastatic lesions, echocardiography was performed bedside in the ICU to evaluate the patient's cardiac status, revealing an EF of 55% and mild tricuspid regurgitation (TRG=31 mmHg). Troponin levels were also checked to assess cardiac muscle function, which was within the normal range. Routine tests including CBC, blood biochemistry, and ABG were sent upon admission, revealing an RBC count of 3.28 million/mm3 and a hematocrit of 31.6%. Two units of packed red blood cells (O+) were transfused.

Furthermore, to restore balance, one unit of platelets and fresh frozen plasma (FFP) were transfused. Routine biochemical tests were also sent for the patient, revealing BUN=24 mg/dl, FBS=301 mg/dl, and AST=82 U/L, all of which were elevated above the normal range. ABG upon initial hospitalization indicated metabolic acidosis, with a PaO2 of 14.6 mmHg, indicating severe hypoxia. To assess the patient's coagulation status and rule out coagulation abnormalities, PT, PTT, D-dimer, and INR were checked, all of which were within the normal range, indicating no coagulation abnormalities. CRP levels were checked for the presence of inflammatory conditions, which were elevated above the normal range at 1/60. To rule out rheumatologic diseases and vasculitis, R.A factor, ANA, and anti-ds-DNA were checked, all of which were within the normal range. However, MPO antibodies (PANCA) tested positive, raising suspicion of rheumatologic diseases.

For the evaluation of vascular status and intra-abdominal organs, abdominal and pelvic ultrasound was performed, revealing a sub centimeter splenic nodule and free fluid in the abdomen. The kidneys and bladder had normal dimensions and volume, with no evidence of malignancy. Additionally, there was no evidence of adenopathy around the aorta, and no evidence of malignancy or masses in the abdomen and pelvis. Breast ducts were normal on breast ultrasound, with no evidence of malignancy, and lymph nodes had normal size and shape. Considering that the patient was of childbearing age and recent reports indicate that pregnancy can be a

predisposing factor for spontaneous hemothorax, β hCG was checked, which tested negative, ruling out pregnancy.

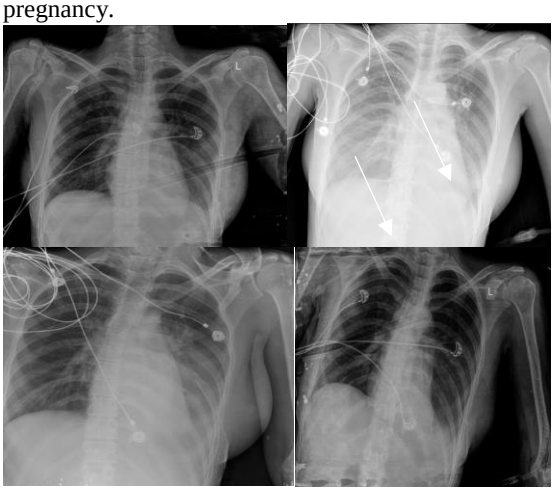

Figure 1- Emergency CT scan of the patient upon admission, showing fluid accumulation in both sides, predominantly on the left (represented with arrow).

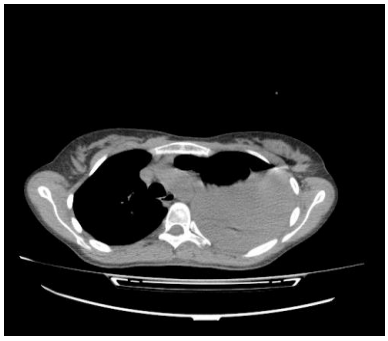

Figure 2- Spiral CT scan of the patient upon admission, showing moderate right-sided pleural effusion with adjacent lung consolidation, as well as severe left-sided pleural effusion with consolidation of the adjacent lung and a shift of the heart and mediastinum to the right.

During the ICU stay, the patient had daily drainage of 300 mL of bloody secretions from the chest tube, and the patient's vital signs remained stable throughout. Neurology consultation was requested due to the patient's history of MS; however, as there were no current symptoms indicative of an MS attack, emergency consultation was not requested, but rather an elective neurology consultation was sought to determine the course of MS medications. Psychiatric consultation was also requested due to the patient's history of bipolar disorder and previous use of citalopram, which recommended continuation of treatment and referral to a psychiatrist for further management.

On November 25th, after improvement in symptoms, the patient was transferred to a regular ward. Subsequently, CBC, blood biochemistry, and ABG were sent again. The patient's Hb was 9.9 g/dl, and hematocrit was 32.2%. Acid-base disturbance had been corrected, with pH in the normal range (7.39), but PaO2 remained low at 20.1 mmHg. Blood sugar, BUN, and creatinine were within normal limits. With the patient's consent, it was requested for the patient to return for VATS (video-assisted thoracoscopic surgery) one week later. Following this, with the patient's personal agreement, the chest tube was removed, and the patient was discharged from the hospital. During the hospitalization, a rheumatology consultation was requested to investigate vasculitis; however, due to the patient's discharge, the results of the incomplete examination remained pending.

Discussion

Spontaneous hemothorax is a threatening condition, and various factors have been implicated in its occurrence. These include lung tumors, ectopic thymic growth, vascular tumors, hemophilia, thrombocytopenia, pulmonary embolism, tissue plasminogen activator (tPA) administration, Ehlers-Danlos syndrome, Rendu-Osler-Weber syndrome, Von Recklinghausen syndrome, endometriosis, pulmonary infections such as TB, pulmonary infarction, ectopic pregnancy, pancreatitis, vasculitis, extramedullary hematopoiesis, and connective tissue disorders [1,3,8,9].

In the case under study, causes such as ectopic pregnancy, pulmonary embolism, heparin use, warfarin use, and tPA administration were ruled out. However, due to the patient's discharge with personal consent and their failure to return to the hospital for rheumatology consultation, vasculitis, and connective tissue disorders could not be ruled out.

In a study conducted by Yen et al. in 2018, a 60-year-old female patient diagnosed with hepatocellular carcinoma experienced dyspnea two days after undergoing chemotherapy. Upon evaluation through CT and CX-ray, the patient was diagnosed with hemothorax and pleural effusion. Thoracentesis was performed to address the condition. Emergency angiography revealed contrast extravasation from the intercostal artery T10, prompting the administration of transcatheter arterial embolization (TAE) using lipiodol and gelatin, which successfully halted the active bleeding. Conversely [10], in our patient, carcinoma etiology was dismissed based on normal findings from abdominal and pelvic ultrasound examinations, absence of abnormalities in internal organ appearances, and the lack of widespread or metastatic lesions.

In a separate case study presented by Miyazaki et al. in 2011, a 59-year-old female with a history of vascular Ehlers-Danlos syndrome (VDR) experienced sudden-onset dyspnea. CT and CX-ray examinations confirmed the presence of hemothorax, although no evidence of arterial rupture or malignancy was observed. Video-assisted thoracoscopy (VATS) was subsequently performed, revealing the source of bleeding to be the right subclavian artery. Arterial ligation was conducted to

address the issue [11]. However, due to the patient's discharge with personal consent and the absence of follow-up for VATS, this particular case was not investigated further in our patient's clinical context.

Another case reported by Gupta et al. in 2021 involved a 79-year-old woman presenting with dyspnea and chest pain. Emergency CT revealed evidence of pleural effusion. Thoracentesis was performed, yielding bloody secretions. Subsequently, the patient underwent lung biopsy, and histopathological examination confirmed lung adenocarcinoma [12]. In our patient, however, the absence of any metastatic lesions or masses in the lungs was confirmed through spiral CT and CX-ray examinations.

A report by Fan et al. in Japan in 2019 described a 61-year-old woman who presented to the emergency department with unilateral chest pain and syncope episodes. Thoracentesis resulted in the drainage of bloody secretions. With an increase in serum IgG4 levels and histopathological examination of pleural fluid and mediastinal lymph node samples, IgG4-related disease (IgG4-RD) was confirmed in this patient [13]. However, similar to the previous case, this was not investigated further in our patient due to her discharge with personal consent and the absence of rheumatology consultations.

Conclusion

Considering the information provided and reported cases worldwide, spontaneous pneumothorax can occur due to various reasons. Patients presenting with dyspnea, chest pain, and back pain should consider spontaneous pneumothorax as a differential diagnosis. In some studies, the primary cause of bleeding remains unidentified. Similarly, in our study, the primary cause of pneumothorax was not identified due to the patient's non-cooperation and discharge with personal consent. However, based on the positive CAPNA, exclusion of thromboembolism, appropriate aortic appearance, absence of abdominal, pelvic, and breast malignancies, vasculitis, granulomatosis, Wegener's syndrome, and Churg-Strauss syndrome, the possibility of these conditions was ruled out. Furthermore, considering previous studies, connective tissue diseases and vasculitis were also discussed, but due to the patient's lack of follow-up, a definitive diagnosis could not be made.

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