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A Blebs Game Of Bluff – Hit Or Miss – A Case Report

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Abstract

Background: Spontaneous pneumothorax, a clinically or radiologically complicated lung disease results in silent mortality. It also occurs in apparent healthy people with no demonstrated pulmonary lesion. They were usually young, male and have been in good health before the occurrence of the first episode. This rare case report aims to understand the sudden occurrence of the spontaneous pneumothorax in an apparent healthy young individual with the presentation of ruptured bleb.

Case Presentation: A 20-year-old male patients came to Emergency Department with complaints of breathing difficulty and right sided chest pain. On arrival his oxygen saturation (SpO_2) was 84% on room air, blood pressure 80/40 mmHg, and pulse rate 82 beats/min. Radiological examination revealed signs suggestive of pneumothorax. A prompt diagnosis and the treatment with right safe triangle intercoastal drainage (ICD) tube was done. On day 5, the ICD removed and the radiologically result revealed a healed lung.

Conclusion: The successful treatment of a tension pneumothorax depends on early recognition, proactive intervention, and early consideration by emergency and trauma care physician. Thus, in our case the cause was a rare being a ruptured bleb, our timely approach and presence of mind has saved the life of the patient.

Keywords: NIL

Introduction

Pneumothorax where the free air enters the potential space between the visceral and parietal pleura.[1] Primary pneumothorax arise in healthy people without any clinical lung condition either spontaneously or from penetration of the intrapleural space by trauma while, secondary pneumothorax arises in patients with underlying lung conditions.[1,2] Tension pneumothorax (TP) is an uncommon condition with a high mortality rate, as it results from positive pressure in the pleural space.[1]

TP develops as inhaled air accumulated in the pleural space but cannot exit due to a check-valve system.[1] It is one of the condition most frequently reported to occur in prehospital, emergency department, and intensive care unit (ICU) settings.[1,3] The incidence is difficult to determine as 1/3[rd] of cases in trauma centres have decompressive needle thoracostomies before reaching the hospital and not all of these might be TP.[3] While reason for occurrence of pneumothorax can be traumatic or non-traumatic. Thus, this condition is frequently lethal without early diagnosis and treatment.[1,2,4] In this paper, we have this case where the occurrence was not due to trauma, but a spontaneous ruptured bleb. Informed consents were obtained from the patient before conducting the study. Privacy and confidentiality were maintained throughout the study.

Case Report

A 20-year-old, male was referred to emergency room with complaints of breathing difficulty since morning. Initially patient had complaints of right sided chest pain and progressively developed breathing difficulty, where he was immediately taken to a nearby hospital. The patient had no history of smoking. He had an episode of vomiting while ambulating, and he started to desaturate, so he was evaluated and referred to our tertiary care hospital.

On arrival his oxygen saturation (SpO_2) was 84% on room air, blood pressure 80/40 mmHg, pulse rate 82 beats/min, and 15/15 Glasgow coma scale score. Chest examination revealed that chest wall inspection was symmetrical with equal chest rise and no bony crepitus. On percussion, hyperresonance on the right chest wall with reduced to absent breath sounds on right hemithorax. Laboratory results include ABG (Arterial blood gas) showed pH 7.39; pCO_2 32.6 mmHg, pO_2 103 mmHg, haematocrit 34%, sodium 143 mmol/L, potassium 3.92 mmol/L, chloride 106 mmol/L, creatinine 0.4 mg/dL, urea 20 mg/dL, random blood glucose 94 mg/dL, normal urine routine, negative COVID-19 antigen, prothrombin time test 22 seconds, and 1.6 INR. Fluid cytology of BAL (bronchoalveolar lavage) reveals that turbid with smears are moderately cellular and colourless with WBC (white blood cell) was 3 cells/mm^3.

Bedside chest x-ray (BS-CXR) and point-of-care ultrasound (POCUS) showed *a positive barcode sign* and *absence of sliding* with right visceral pleura line suggestive of pneumothorax. **(Image 1)** Immediately bedside needle decompression was done over right safe triangle. The post procedure computed tomography (CT) thorax was obtained revealed a right fully collapsed lung. **(Image 2)** Under aseptic precaution over right safe triangle intercoastal drainage (ICD) tube was placed and fixed, **(Photo 1)** position was confirmed by BS-CXR. Post ICD patient improved symptomatically, and his overall vitals stabilized. Expert opinion was obtained from pulmonology team and explorative bronchoscopy was done as serial CT showed inadequate recoiling of the right lung and pleural bleb in the right upper lobe. In view of persistent air leak autologous blood patch pleurodesis was done by pulmonology team and was monitored with serial CXR. On the 5^{th} day after pleurodesis, ICD was clamped for 24 hours and removed as there was no pneumothorax on the CXR. **(Image 3)** Patient was managed symptomatically and was discharged.

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Image 1: Bedside chest x-ray (BS-CXR)

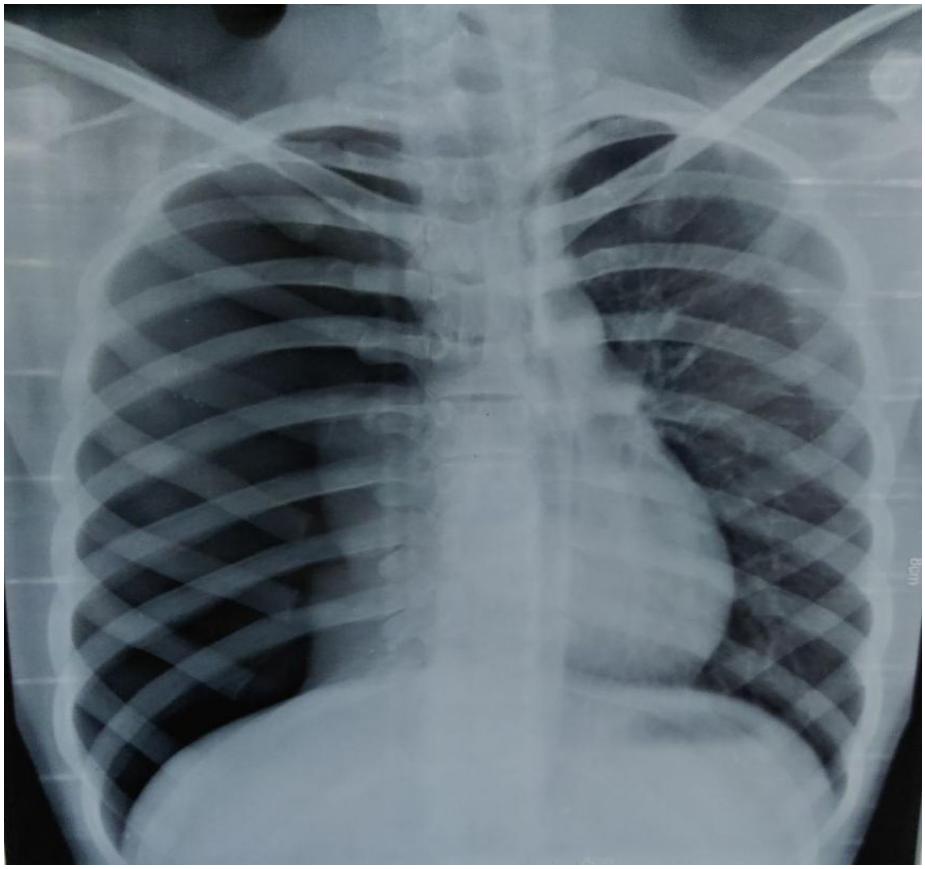
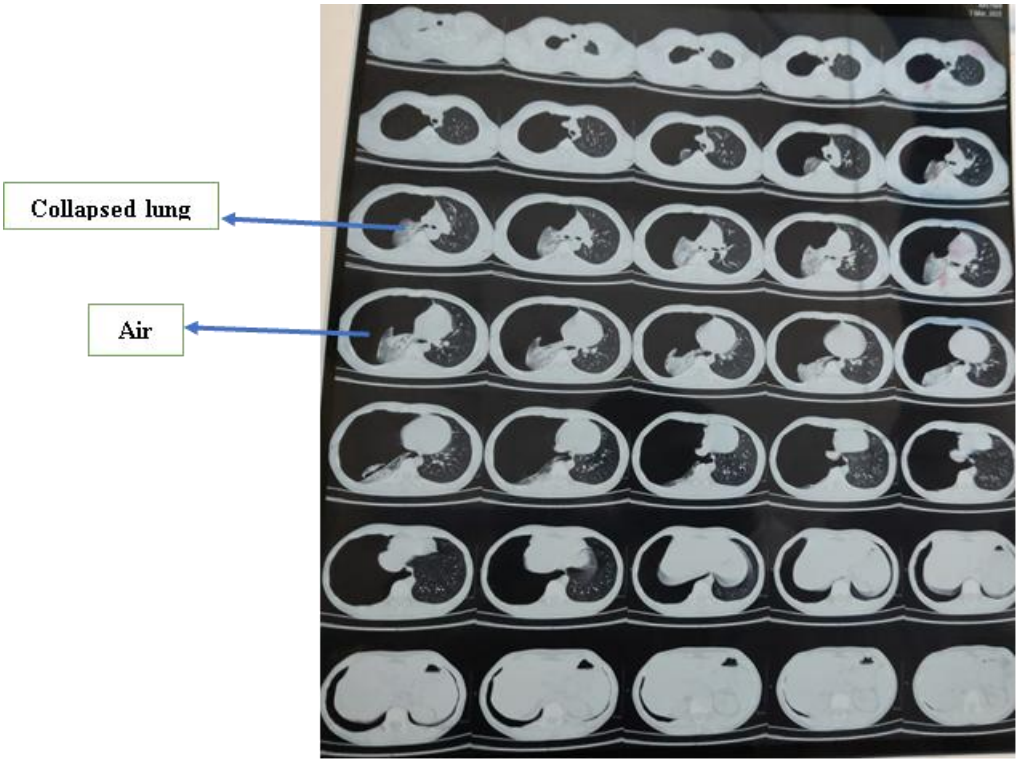


Image 2: Computed tomography (CT) thorax revealed a right fully collapsed lung with air



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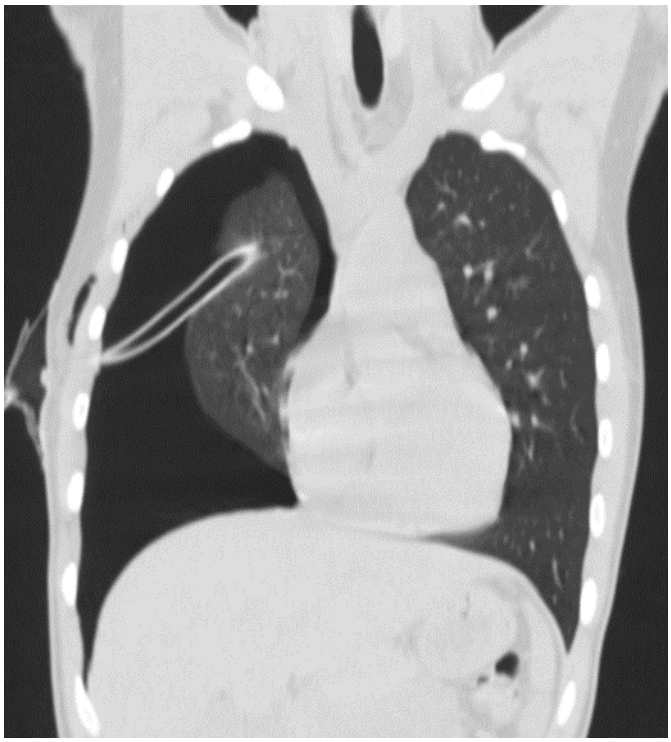

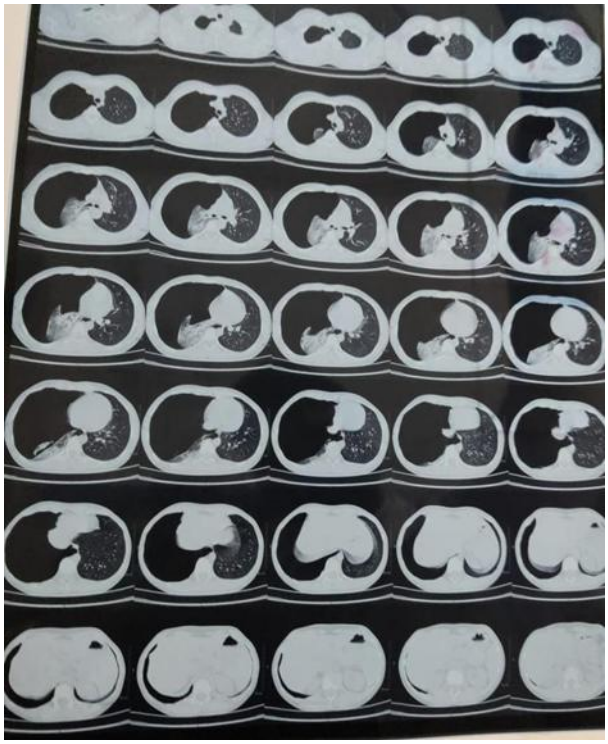

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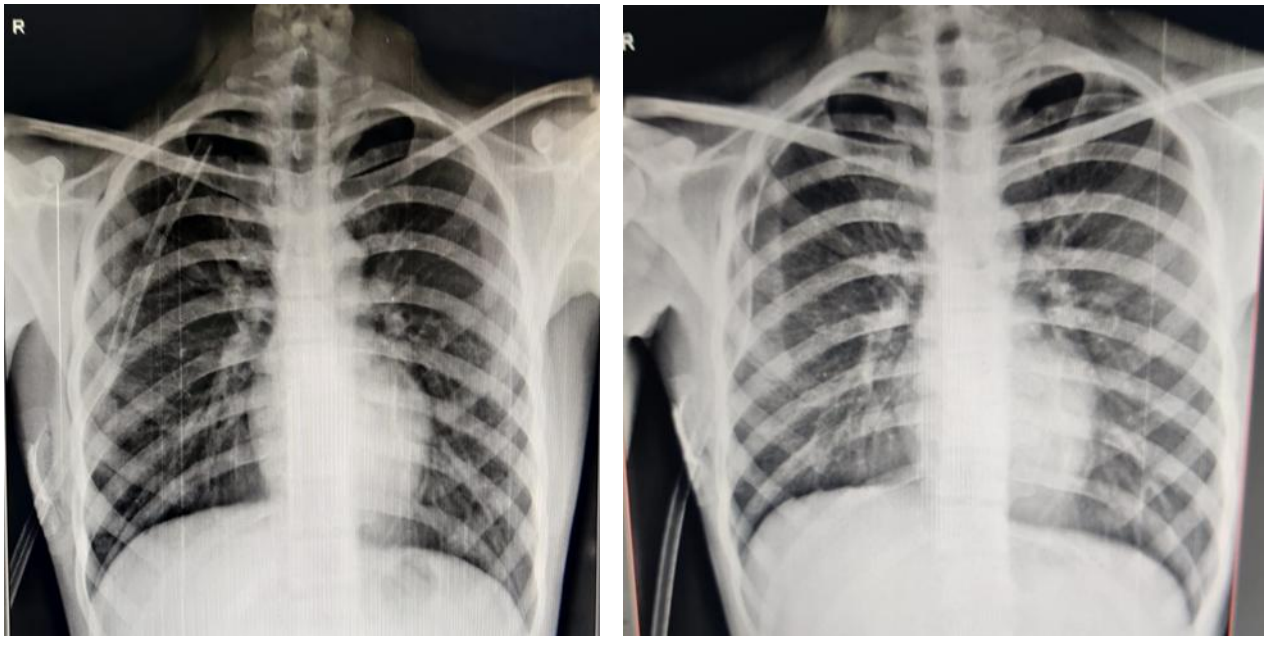
Photo 1: Intercoastal drainage (ICD) tube was placed and fixed at the right safe triangle (Photo was taken after patient's consent)

Image 3: Serial CXR finding at the time of discharge



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Discussion

Pneumothorax and its classification

Pneumothorax, *a collection of air outside the lung but within the pleural cavity.*[3,5] The term pneumothorax was first coined by Itard in 1803. It is classified into spontaneous (primary and secondary), traumatic and tension pneumothorax. The reported incidence of primary pneumothorax among young adults was about 7.4–18 (age-adjusted) and 1.2–6 cases/1,00,000 population among adults and remained as a significant global health problem among healthy subjects.[2,6]

Primary spontaneous pneumothorax (PSP) defined as *the spontaneous occurrence of pneumothorax in patients without apparent underlying pulmonary disease, predominantly in young adults.*[1] The typical causes includes young, stature (tall, thin), familial, and smokers.[1,4,7] As for secondary it occurs in presence of underlining lung disease due to chronic bronchitis, emphysema, tuberculosis, bronchial asthma, cystic fibrosis, and Marfan's syndrome.[1–3] In case of traumatic, it occurs due to gunshot or stab injury.

Tension pneumothorax

TP develops as inhaled air accumulated in the pleural space but cannot exit due to a check-valve system as it results from positive pressure in the pleural space throughout the respiratory cycle, leading to decreased venous return, hypotension, and hypoxia.[1,3] TP presented with the shift in mediastinal structures with compromised cardiopulmonary function and is life-threatening, requires immediate treatment.[8] The intrathoracic pressure (>15 to 20 mmHg) increases, as the great vessels and heart are compressed and shifted contralaterally, the severely restricting venous return, diastolic filling, and cardiac output causing ventilation-perfusion mismatch, and result in hypoxia and shock. Also, TP an develop in the presence of a chest tube if gas egress is obstructed, including from the adjacent lung.[1]

Despite the absence of underlying pulmonary disease in this patient with primary pneumothorax, subpleural blebs and bullae are likely to play a role in the pathogenesis. It was described by Henry et al[2] that bullae and blebs were responsible and found in up to 90% cases at thoracoscopy or thoracotomy and in 80% of case on CT thorax. The aetiology of such changes in apparently healthy lungs is yet unclear.[2,9,10] The anatomical lesion, a bleb and bullae, described by Miller (1947) caused by alveolar rupture, allows air to travel through the interlobular septum that divides the secondary pulmonary lobules to the subpleural region. On CT it appears as a thin-walled cystic air space contiguous with the pleura.[7]

The exact pathogenesis of the spontaneous occurrence of air space between the alveolar spaces and the pleura remains unknown. Most authors believe that spontaneous rupture of a subpleural bleb, or of a bulla, is always the cause of PSP.[3,4,11,12] Also, it was unclear that how often these lesions are actually the site of air leakage. Only, a small number of blebs were ruptured at the time of thoracoscopy or surgery, while in remaining cases due to other lesions, it leads to TP and referred as 'pleural porosity'.[4,11–14] The development of blebs, bullae, and areas of pleural porosity may be linked to a variety of factors, including the distal airway inflammation, hereditary predisposition, anatomical abnormalities of the bronchial tree, ectomorphic physiognomy with more negative intrapleural pressures, and apical ischemia at the apices, low body mass index, caloric restriction and abnormal connective tissue.[3,11,12,15,16] The history in the past is important as the recurrence is seen in 15 to 40% of cases and recurrence on the contralateral side can also occur.[8]

The aetiology or causes of TP include penetrating or blunt trauma, barotrauma due to positive pressure ventilation, percutaneous tracheostomy, conversion of spontaneous pneumothorax to tension and open pneumothorax when occlusive dressing work as one way valve.[2,3,11] The clinical findings added to pneumothorax for TP include tachycardia, hypotension, jugular venous distension, cyanosis, respiratory failure, and cardiac arrest.[2,3,11] The hallmark signs include tracheal deviation away from the involved side, hyperresonance of the affected side, hypotension, and significant dyspnea.[1]

Diagnosis can be confirmed in the majority of cased with an upright posteroanterior CXR, which also makes it possible to estimate the pneumothorax with good accuracy.[11] Radiographic finding of 2.5cm air space which are equivalent to a 30% pneumothorax.[3] USG findings shows the absence of lung sliding, the absence of a comet-tails artifact, and the presence of a lung point with 94% sensitivity and 100%

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specificity with skilled operator.[8] In case if the patient was hemodynamically unstable with suspected TP, intervention is not withheld to await imaging and needle decompression can be performed.[3,14,17,18]

Treatment

The ER treatment goal is the elimination of intrapleural air. It should be diagnosed clinically before a radiograph and immediately treated by the needle decompression followed by tube thoracostomy.[1–3] Other treatment options include oxygen, observation, needle or catheter aspiration and tube thoracostomy.

As for TP, immediate needle decompression followed by moderate or large-sized chest tube insertion, water seal drainage, and immediate chest tube placement ideal. Aspiration with needle or catheter had a success ranging from 37% to 75% or higher in those with PSP.[1,3,4,11] Needle decompression or underwater seal, under aseptic precaution, local anaesthesia will be given followed by a wide bore needle is placed over the safe triangle. The borders include anterior latissimus dorsi, posterior pectoralis major and straight line at the level of nipple.[19] It can be done if the patient is hemodynamically unstable and clinical suspicion is high. This helps in the re-expansion of the collapsed lung. A chest tube is usually placed in the safe triangle and an immediate CXR to be taken to assess the resolution of pneumothorax and placement of the tube.[8] Followed by serial CXR to be taken for the assessment. If the lung fully expanded with no air leaks are visible in the underwater seal, then the tube can be removed.[1,2,8,19]

As for the needle decompression, it was recommended that in unclear cases, a video-assisted thoracoscopy will be required for establishing a diagnosis, as it might also develop as a fistulae in the later periods, which was considered to be a complication of the ICD.[20] Although in our patient in our patients, based on the clinical judgement due to emergency alarm, and hemodynamic stability, we performed emergency needle decompression and used CT before the next-step in the management. Still, it is essential to diagnose the underlying aetiology of the patient, with imaging modalities.

Conclusion

The successful treatment of a tension pneumothorax depends on early recognition, proactive intervention, and early consideration by emergency and trauma care physician. Once the diagnosis is confirmed, early needle decompression and ICD placement should be considered. In this case the cause was a rare being a ruptured bleb, our timely approach and presence of mind has saved the life of the patient.

Abbreviations

Tension pneumothorax – TP; Intensive care unit – ICU; Oxygen saturation on room air – SpO_2; Arterial blood gas – ABG; Bronchoalveolar lavage – BAL; White blood cell – WBC; Bedside chest x-ray – BS-CXR; Point-of-care ultrasound – POCUS; Computed tomography – CT; Intercoastal drainage – ICD; Primary spontaneous pneumothorax – PSP.

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