

Tension pneumothorax in a patient with Covid-19 pneumonia initially misdiagnosed as volvulus

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Abstract

Tension pneumothorax is a condition that can present with a myriad of symptoms, including chest pain, shortness of breath, rapid breathing, and tachycardia. If left untreated, these signs and symptoms can progress to shock causing haemodynamic collapse and even death. At times, it may be difficult to identify tension pneumothorax. We present the case of a 59-year-old male with a prolonged initial hospital course that eventually led to a diagnosis of tension pneumothorax with the use of CT scans rather than traditional X-rays. This case reinforces the idea that clinicians should have a wide differential diagnosis in mind when dealing with vague symptoms and should not hesitate to use different diagnostic modalities to help confirm a diagnosis.

Keywords: Pneumothorax, Intestinal volvulus, Covid-19, Pulmonary fibrosis, Pneumoperitoneum

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Introduction

Tension pneumothorax is a critical finding that can be seen in the setting of pre-hospital, trauma, emergency department, and intensive care unit.¹ It is these findings that cannot be missed and require urgent attention. Tension pneumothorax is estimated to occur in 5% of major trauma patients in pre-hospital settings and 1-3% in ICU patients.¹ The findings are especially catastrophic in mechanically ventilated patients as adjusted risk of death in this population was reported to be approximately 38 times higher in one retrospective cohort study.² Given the urgent call for intervention, chest X-rays are the usual imaging technique of choice as they are quick and readily available. Typical imaging findings of tension pneumothorax include pneumothorax with deviation of trachea, mediastinal shift, as well as flattening of ipsilateral hemi diaphragm.³ We report a rare

case where initial chest X-ray revealed a large pneumothorax vs pneumoperitoneum and subsequent CT of the chest, abdomen, and pelvis was used to make a diagnosis of tension pneumothorax.

Case Report

A 59-year-old male, with no reported past medical history, presented to St. Joseph's University Medical Center in Paterson, New Jersey, after Covid-19 pneumonia in November 2020. His hospital course was complicated with bilateral pneumothorax after intubation which required placement of bilateral chest tubes. Due to prolonged endotracheal intubation ventilation, he required a tracheostomy/PEG. A persistent air leak was noted from the previously placed chest tubes which required a left-sided video-assisted decortication and a lower lobe wedge resection; intraoperatively, extensive intrapleural adhesions were noted. His hospital stay was prolonged due to the inability to wean off mechanical ventilation and complicated with PEG site infection which required placement of open gastrostomy tube. The patient remained admitted to hospital due to respiratory complications of Covid-19. In September 2021, the patient was evaluated by general surgery team for abdominal pain and vomiting. The patient was hypotensive and examination showed generalised abdominal tenderness and distension. Abdominal and chest X-ray revealed a large air pocket in the right upper quadrant suspicious of a large pneumothorax and possible intraperitoneal/retroperitoneal air (Figure A). Given the patient's previous intra-abdominal surgical history and symptoms of abdominal pain and nausea with vomiting, the initial imaging was done for a possible volvulus or pneumoperitoneum from viscus perforation. Surgical options were planned and the patient was booked for exploratory laparotomy. A differential diagnosis of intrathoracic aetiology as diaphragmatic injury or pneumothorax based on plain film studies was made and a CT scan of chest, abdomen, and pelvis was obtained. This revealed a tension pneumothorax causing extrinsic compression of the superior vena cava/right atrium as well as dissection of air into the peritoneal cavity and retroperitoneum. A pigtail catheter was inserted with improvement of tachycardia and haemodynamic status. The catheter was used over a chest tube due to easy

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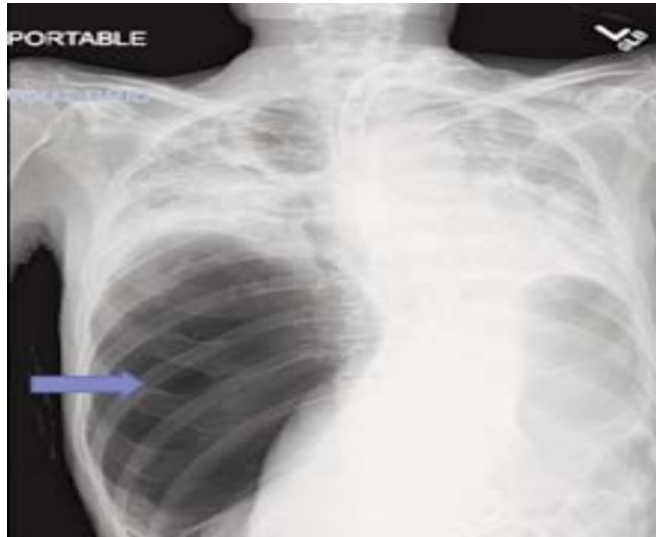


Figure-A: Chest X-ray with arrow pointing at large pocket of air in right upper quadrant

accessibility, patient comfort, and efficient insertion. Subsequent chest X-ray showed improvement of pneumothorax. Unfortunately, his clinical status deteriorated due to sepsis, and the family decided to convert patient care for comfort care soon after the diagnosis of tension pneumothorax. The patient passed away five days after tension pneumothorax was diagnosed. The patient's brother and next of kin agreed and consented for publishing his case details to further educate medical professionals.

Discussion

Tension pneumothorax is a critical finding that requires immediate attention. All health care providers should be familiar with typical chest radiographic findings of a tension pneumothorax; however, with increasing Covid-19 cases which have shown to cause development of lung fibrosis, especially in ICU care and mechanically ventilated elderly, typical chest radiographic findings may be absent on chest X-ray.⁴ A study, published in *The American Surgeon*, demonstrated that XR had only 31.8% sensitivity in identifying pneumothorax vs 81.8% sensitivity of US exam; both exams were inferior to CT scan.⁵ In our case, although US exam was not performed, it would have likely missed the diagnosis as US exam identifies lung sliding usually at the apex. In a complex patient with multiple medical comorbidities such as our patient, desaturations, hypotension, respiratory distress, and other clinical findings may represent many other medical conditions, as acute respiratory distress syndrome, pneumonia, or intra-abdominal pathology. As mentioned earlier, intestinal volvulus was considered in which the intestine twists around itself and the mesentery which



Figure-B: Abdominal X-ray with free intraperitoneal and retroperitoneal air.

can lead to abdominal pain, bowel obstruction, bowel ischaemia, and perforation. Abdominal X-rays display air-filled closed loops of bowel. In severe situations with perforation, free air can be seen. In patients like ours with haemodynamic collapse, the treatment is surgical with bowel resection.⁶ With pneumoperitoneum noted in the right upper abdominal quadrant on chest X-ray, abdominal and thoracic diagnoses must be considered as previously mentioned (Figure B). Without proper imaging, catastrophic diagnosis such as tension pneumothorax may be overlooked. In our case, the intrapleural adhesions and interstitial fibrosis (which were visualised during previous left-sided VATS) and resulted in the loculated pneumothorax at the base and typical findings such as tracheal deviation, diaphragm flattening and mediastinal shift were unclear. In these selected cases, CT thorax may have been a useful diagnostic tool for identifying tension pneumothorax.

Conclusion

Tension pneumothorax is a critical finding that requires immediate attention. Although chest X-rays are important diagnostic tool given the urgency of the matter, due to the patient's extensive pulmonary disease history, some of the typical findings seen in tension pneumothorax were not noticed on chest X-ray. Our patient had multiple factors that complicated the diagnosis. Preceding chest tubes as well as abdominal surgeries created a mixed clinical picture. The loculated nature of the pneumothorax resulted in normal tracheal outline as well as difficulty visualising the contour of the diaphragm. Due to these reasons, further modalities such as CT scans were used for diagnosis. At this time, there are

not many studies that have evaluated the specificity and sensitivity of chest X-ray as imaging modality for diagnosing tension pneumothorax. In select cases, CT may be a useful tool in diagnosing tension pneumothorax that could not be properly assessed by chest X-ray.

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