

CASE REPORT

# Nontuberculous mycobacterial infection presenting as empyema and life threatening pneumothorax: A challenging situation in the emergency department

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## ABSTRACT

Nontuberculous mycobacterial infection in an immunocompetent young patient complicated with empyema and pneumothorax is rarely reported. A 36-year-old man presented to the emergency department with a history of worsening dyspnea and pleuritic chest pain. The patient had unstable vital signs on presentation, and was referred to the resuscitation area on a monitored bed. The patient had a chest x-ray (CXR) performed on a prior occasion at a primary health clinic, revealing pneumothorax and some fluid at the left costophrenic angle. On arrival at the hospital, bedside ultrasound was performed which confirmed the diagnosis of pneumothorax. His vital signs were pulse 153, BP 88/62, RR 50 breaths per minute and his oxygen saturation on air was 92%. Tension pneumothorax was diagnosed based on clinical presentation and given vital signs. It was managed immediately with needle decompression followed by chest tube insertion. The patient improved dramatically after needle decompression with stabilization of vital signs. A CXR was repeated post-needle decompression which showed an incompletely resolved pneumothorax with an increase in the size of the effusion. Iatrogenic haemothorax was a possible explanation for this increase in effusion size. Chest tube was successfully inserted in the fourth intercostal space just anterior to the midaxillary line under full aseptic precautions. The chest tube drained 1.4 liters of blood, which on analysis showed a low pH and elevated adenosine deaminase level. Two out of three sputum samples sent from the medical ward were positive for mycobacteria other than tuberculosis as confirmed on culture. The patient's

symptoms improved with percutaneous tube drainage of hemopneumothorax and antituberculous medications.

Keywords: nontuberculous mycobacteria, tension pneumothorax, empyema, iatrogenic hemothorax, pleural effusion

## INTRODUCTION

Nontuberculous mycobacterial (NTM) infection rarely involves the pleural space. A combination of empyema and life threatening tension pneumothorax in NTM is not common. Tension pneumothorax constitutes a medical emergency that requires prompt recognition and immediate decompression. Any delay in the management may lead to an increase in mortality. An emergency needle decompression followed by a tube thoracostomy is the standard treatment for tension pneumothorax. One of the complications associated with needle decompression is hemothorax. We report a case of NTM infection with first clinical presentation to the ED as tension pneumothorax with effusion (empyema). Furthermore, we highlight how emergency physicians can possibly avoid iatrogenic hemothorax whilst treating tension pneumothorax.

## CASE REPORT

A 36-year-old male patient initially presented to a primary health clinic (PHC) with acute onset of dyspnea and left-sided pleuritic chest pain. The pain was severe enough to wake him from sleep. On initial presentation to the PHC, he was discharged with symptomatic treatment. The patient revisited the PHC after 12 hours with worsening symptoms. Chest x-ray (CXR) was performed at this point which revealed a large pneumothorax with minimal pleural effusion (Figure 1). He was then referred to the ED for further treatment. On arrival at the ED, on initial triage, his vital signs were recorded as a BP of 115/71 mm Hg and an oral temperature of 36.0°C. A regular pulse rate of 153 beats/min, respiratory rate of 28 breaths/min, oxygen saturations of 100% on room air and visual analogue pain score of 30/100 were recorded.

The patient's presenting complaint was progressively worsening breathlessness for a month. He presumed that it was due to his asthma symptoms and kept using bronchodilator inhalers he had previously been prescribed. He didn't seek any medical advice until his symptoms worsened and he no longer responded to



**Figure 1.** Initial chest x-ray performed at the primary health clinic.

the inhaled bronchodilator. He reported 5 kg weight loss in the last two years. He had no history of hemoptysis, cough, fever or night sweats. He reported no history of exposure to pulmonary tuberculosis or any recent trauma. He was a smoker of one pack a day for 20 years and asthmatic for 2 years. He denied any other past medical history.

On physical examination, the patient had diminished air entry on the left side of his chest with hyperresonance to percussion. In the emergency room, while the patient was being managed by an emergency physician, he became distressed and dyspneic. His respiratory rate increased to 50 breaths/min and blood pressure dropped to 88/62 mm Hg. He was sweating profusely. Bedside ultrasound was performed which confirmed features of left-sided pneumothorax with a small amount of fluid in left costophrenic angle. The CXR from the PHC was reviewed, and given the deterioration in the patient's clinical condition, a diagnosis of tension pneumothorax was made. Immediate needle decompression was performed by identifying the landmarks in the second intercostal space in the midclavicular line using a 14G needle which later was connected to a three-way tap with a 50 cc syringe. Following this, the patient improved hemodynamically as well symptomatically. Post-procedure, the observations were recorded as the following: pulse 115 beats/min, BP 110/80 mm Hg, RR 38 breaths/min and an O<sub>2</sub> saturation of 100%.

CXR was repeated post-needle decompression (Figure 2), which showed a smaller pneumothorax and an increase in the size of the effusion compared to the



Figure 2. Post-needle decompression.

first CXR from the PHC (Figure 1). An acute increase in the size of the effusion could be explained by an iatrogenic hemothorax created whilst attempting a needle decompression. At this point, a chest tube was inserted which immediately drained 1.4 liters of blood, suggesting an iatrogenic hemothorax (Figure 3). The patient was admitted to the medical ward as a case of tension pneumothorax and hemothorax for further evaluation and management.

Blood examination showed leukocytosis with a white blood cell (WBC) count of  $21.6 \times 10^3 \mu\text{l}$  (83.5% neutrophils), hematocrit of 29.1%, MCH of 30 picograms/cell, platelets of 202/microliter and anemia (Hb 7.7 g/dl). The patient received antibiotics and blood transfusion respectively. The erythrocyte sedimentation rate was 36 mm/hour and the CRP was 52 mg/L. Pleural fluid analysis showed glucose of 2.6 mmol/L, LDH of 177 U/L, total protein of 55 g/L, a pH of 7.170 and adenosine deaminase in the pleural fluid of 47 IU/L which was high. The pleural fluid appearance was bloody, with a WBC of 7500/microliter, neutrophils 80% and lymphocytes 20% and a RBC of 3570000/microliter. The aspirated pleural fluid was sent for biochemical analysis. The low pH pleural fluid and presence of effusion before needle decompression on initial CXR (Figure 1) indicated a presence of initial empyema. This may have mixed with the iatrogenic hemothorax. Pleural fluid cultures were negative for bacteria, fungi and mycobacteria. Two of three sputum samples showed positive culture for mycobacterium other than tuberculosis, indicating NTM infection. Blood cultures were negative and HIV serology tested negative for the patient.

CT scan was requested post-chest tube insertion, which revealed consolidation in the left lower lung lobe, atelectasis changes in the posterior segment of the left upper lung lobe, a trace of pleural effusion and an air-bronchogram in the left lower lobe (Figure 4). Pleural biopsy revealed skeletal muscle and fibrous tissue with mild chronic inflammation. Zeilh-Neelsen stain for acid-fast bacilli was negative and no definite granuloma was appreciated. Chest tube was removed after one week and the patient improved clinically. The patient was discharged on isoniazid and rifampicin home treatment. Follow up chest x-rays revealed a reduction in pleural effusion, adhesions in the left costophrenic angle as well as a nodular opacity  $7 \times 6$  mm in size above the upper pole of the right hilum.

## DISCUSSION

Nontuberculous mycobacteria are ubiquitous organisms that rarely cause disease in immunocompetent individuals. Person-to-person transmission has not been previously described.<sup>(1,2)</sup> However, over the past few decades, there has been an increase in the number of cases of mycobacterial infections caused by nontuberculous species.<sup>(3)</sup> Although the clinical



Figure 3. Post-chest tube insertion.



Figure 4. Chest CT scan.

and radiological features of nontuberculous mycobacterium infection resemble those of tuberculosis, reporting of significant pleural effusion, pneumothorax and empyema are rare in cases of NTM infection.<sup>(3,4)</sup> The rate of simple pneumothorax in patients with active NTM is still higher and estimated to be 2.3% in one study and 4.1% in another study.<sup>(5-7)</sup> To our knowledge, there are no previously reported cases of tension pneumothorax as an initial presentation of a NTM infection.

Nontuberculous mycobacterial lung disease is classified into cavitating and bronchiectatic forms depending on its clinical and radiologic characteristics.<sup>(2,8)</sup> Common findings in the chest radiograph include upper lobe cavity lesions and endobronchial involvement which is evidenced by nodules adjacent

to the foci of disease, cicatricial atelectasis, pleural thickening, bronchiectasis and small nodules in the right middle lobe and left lingular division.<sup>(2,8)</sup> Our patient's x-ray and CT scan exhibited a few of the above mentioned features.

Anterior needle decompression in the second intercostal space, midclavicular line, is the recommended treatment for tension pneumothorax.<sup>(9,10)</sup> Anatomical structures around the decompression landmark are the internal mammary artery medially and the subclavian vessels and subcostal neurovascular bundles superiorly. There are case reports of life threatening iatrogenic injuries following trauma to these structures during needle thoracocentesis.<sup>(11,12)</sup> In a case series, it has been postulated that the fifth intercostal space, anterior to the midaxillary line may be a preferable landmark as compared to the second intercostal space in the midclavicular line. This approach avoids the bulky anterior chest wall muscles, major vessels and the lung tissue that lies closer to the anterior chest wall in the second intercostal space.<sup>(11)</sup> Rawlins et al.,<sup>(11)</sup> suggest that an alternate approach such as the fifth intercostal space may be safer and should be considered. However, with the axillary approach pleural adhesions are more likely to be present in the lower chest cavity.<sup>(13,14)</sup>

## CONCLUSION

In summary, NTM infection may present with pneumothorax and empyema in an immunocompetent patient. Care should be taken while attempting needle decompression for tension pneumothorax. Choosing the fifth intercostal space anterior to the midaxillary line as an alternative approach to the anterior second intercostal space, may be considered to avoid iatrogenic hemothorax.

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