Pratap *et al.*
The Egyptian Journal of Bronchology (2022) 16:28
https://doi.org/10.1186/s43168-022-00134-w

The Egyptian Journal of Bronchology

CASE REPORT Open Access

An unusual cause of pneumomediastinum and acute respiratory distress syndrome

U. Pratap, M. Ravindrachari*, L. Sneha and G. Vishnukanth

Abstract

Background: Progressive acute respiratory failure with *Mycobacterium tuberculosis* (TB) in immunocompetent individuals is rare, and if detected early, diagnosis and treatment dilemmas can be limited. We report here a unique case of respiratory failure due to tubercular spontaneous pneumomediastinum complicated by acute respiratory distress syndrome (ARDS).

Case presentation: A 24-year-old male of low socioeconomic background presented with shortness of breath, dry cough, and fever for 7 days, which was accompanied by weight loss and a reduced appetite. The patient had tachypnea and hypoxemia ($SpO_2 = 86\%$). The patient's condition deteriorated ($SpO_2 = 72\%$ with 12 L min^{-1} of O_2 delivered using a non-rebreather mask), and he was intubated using a lung-protective approach with a tidal volume of 350 mL (6 mL kg^{-1}), positive end-expiratory pressure (PEEP) of 5 cm H_2O, RR of 20 cycles/min, a flow rate of 35 L min^{-1}, and FiO_2 of 0.6. High-resolution computer tomography of the thorax showed multilobar consolidation, pneumomediastinum, and extensive subcutaneous emphysema with left-sided pneumothorax. Subsequently, a left-sided tube thoracostomy was carried out. The PaO_2/FiO_2 (P/F) ratio immediately after intubation was 130 and rose to 170 post-thoracostomy, which was suggestive of moderate ARDS. Bacterial and fungal colonies detected from the blood and endotracheal aspirate were normal. However, for the endotracheal aspirate, the cartridge-based nucleic acid amplification test (CBNAAT) detected TB with no rifampicin resistance. The patient was started on anti-tubercular therapy (ATT). Despite ATT, the patient developed circulatory shock and died after 4 days.

Conclusions: In young patients with acute spontaneous pneumomediastinum and ARDS, TB infection should be considered during initial diagnostics. This consideration may lead to timely treatments and improved patient survival.

Keywords: Tuberculosis, Pneumomediastinum, Acute respiratory distress syndrome (ARDS), Subcutaneous emphysema

Background

Pulmonary tuberculosis (TB) may present in different forms by involving almost all organs in the body, out of which the lungs are most commonly involved. The common presenting features are cough with expectoration, fever, generalized weakness, and dyspnea which usually will not respond to routine antibiotics. Progressive respiratory failure in immunocompetent individuals affected by TB is very rare and can cause a dilemma in the diagnosis and management of the case.

Our case is unique in the sense that a young patient with no comorbidities presented with tubercular spontaneous pneumomediastinum with pneumothorax complicated by acute respiratory distress syndrome (ARDS) which is unusual in association.

Case presentation

A 24-year-old male presented with shortness of breath, dry cough, and fever for 7 days, which was accompanied by weight loss and a reduced appetite. He is not a smoker and not an alcoholic. There was no history of chest pain,

*Correspondence: ravindra.chary.6363@gmail.com

Department of Pulmonary Medicine, Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER), Puducherry 605006, India

trauma, aspiration, or poison intake. The patient did not have any prior history of respiratory or systemic illnesses.

Vitals at presentation

BP = 100/70 mmHg, PR = 110/min, respiratory rate (RR) = 24 cycles/min, SPO_2 = 86% in room air and 95% with 5 L of oxygen via face mask

On examination

Swelling over the neck and chest wall was observed and characteristic Rice Krispies sensations were felt. The patient appears to be poorly nourished with a BMI of 19.6 kg/m^2. There was no cyanosis, pedal edema, lymphadenopathy, or clubbing. Surgical crepitations were heard on auscultation over the swollen areas.

Investigations

Hemoglobin = 13.8 gm%, total leukocytes = 15,450/mm^3 with 54% of neutrophils, and platelets = 2.5 lakh/mm^3. Renal and liver function tests were normal. HIV and HBsAg serologies were negative.

Management

In view of the sudden onset of shortness of breath and subcutaneous emphysema, oral Gastrografin (diatrizoate meglumine and diatrizoate sodium) study with high-resolution computer tomography (HRCT) thorax was done to rule out esophageal and pulmonary causes. HRCT thorax showed bilateral multilobar consolidation with pneumomediastinum and subcutaneous emphysema noted in the neck and chest wall with a thin rim of left-sided pneumothorax (Fig. 1). There was no mediastinal lymphadenopathy and no leak of oral Gastrografin into the mediastinum or pleural cavity. Left tube thoracostomy was done in view of pneumothorax. USG abdomen and 2D echo were normal.

The patient was treated with broad-spectrum antibiotics initially. In due course, the patient developed persistent fever spikes. Scrub typhus and *Leptospira* screening were negative. The patient's condition deteriorated (SpO_2 = 72% with 12 L $min^{-1}$of O_2), and he was intubated using a lung-protective approach with a tidal volume of 350 mL (6 mL kg^{-1}), PEEP of 5 cmH_2O, RR of 20 cycles/min, a flow rate of 35 L min^{-1}, and fraction of inspired oxygen (FiO_2) of 0.6. HRCT thorax showed multilobar consolidation, pneumomediastinum, and extensive subcutaneous emphysema with left-sided pneumothorax. Subsequently, a left-sided tube thoracostomy was carried out. The PaO_2/FiO_2 (P/F) ratio immediately after intubation was 130 and rose to 170 post-thoracostomy, which was suggestive of moderate ARDS.

Repeated blood and endotracheal aspirate bacterial and fungal cultures were normal. Endotracheal aspirate cartridge-based nucleic acid amplification test (CBNAAT) detected *Mycobacterium tuberculosis* (MTB) with no rifampicin (Rif) resistance. The patient was started on anti-tubercular therapy (ATT) (ethambutol/isoniazid/pyrazinamide/rifampicin). The patient developed circulatory shock in due course, despite escalating doses of noradrenaline, and he continued to decline and died after 4 days even with ATT.

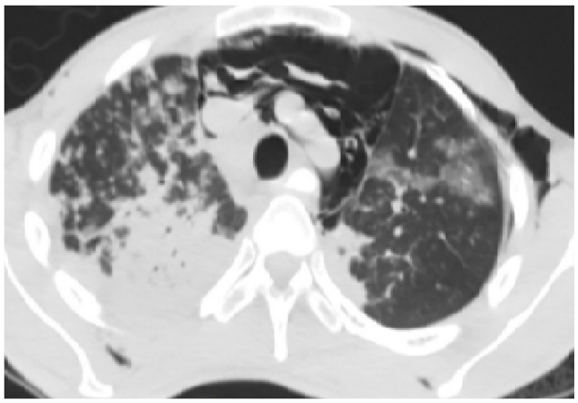

Fig. 1 Bilateral multilobar consolidation with pneumomediastinum and subcutaneous emphysema noted in the neck and chest wall

Discussion

MTB can involve any part of the body and can be a great mimicker of any disease. Atypical presentations and respiratory failure with TB can be seen usually in immunocompromised individuals with disseminated disease. The incidence of respiratory failure in active tuberculosis can range from 1.5 to 5.0% and will usually be seen with fibrocavitary and miliary disease [1, 2].

Though less reported, atypical presentations like pneumomediastinum can be seen in few cases of pulmonary TB with or without subcutaneous emphysema in miliary, non-miliary, and cavitatory forms [3]. Pneumomediastinum occurring in tuberculosis is one of the rare presentations of TB and can cause difficulties in diagnosis and treatment of the case [4].

Subcutaneous emphysema and pneumomediastinum are relatively common in blunt or penetrating trauma, infections of the chest wall, violent cough, and strenuous vomiting which leads to a rapid increase in alveolar pressure, and as a result, air escapes into the mediastinum along bronchovascular bundles. It can also occur in certain diseases like COPD, interstitial lung disease, bronchogenic carcinoma, tuberculosis, and pneumonia [5].

Our patient initially presented with cough and subcutaneous emphysema. On evaluation, there was no esophageal injury and CT thorax suggested multilobar consolidation and spontaneous pneumomediastinum with extensive subcutaneous emphysema which could have resulted from excessive paroxysms of cough or from the underlying disease.

The course of spontaneous pneumomediastinum is usually benign. Our patient is managed conservatively along with broad-spectrum antibiotics. All routine blood investigations and sputum and blood culture reports were normal. The patient's condition worsened, giving suspicion of ARDS and fulfilling the Berlin criteria. The PaO_2/FiO_2 ratio immediately after intubation was 130 and rose to 170 post-thoracostomy, indicating moderate ARDS.

As per the Berlin definition, the period between ARDS and risk factor exposure should be a maximum of 7 days. ARDS can be classified as follows: ratio ≤ 300 and >200 is mild; 100–200 is moderate; and <100 is severe with a minimum PEEP of 5 cmH_2O excluding hypoxemia caused by atelectasis. The imaging criterion of ARDS is bilateral infiltrate that cannot be explained by effusion, collapse, or lung nodule [6]. CT scan can be used instead of chest X-ray which shows heterogeneous bilateral pulmonary infiltrate mainly in gravity-dependent lung regions [7].

TB is a rare cause of ARDS and usually seen with disseminated and miliary forms of tuberculosis [8]. Although disseminated TB and ARDS are uncommon, one should suspect this association in any case of ARDS with an unknown etiology. Recent multicentric trials in Asia correlating extensive tuberculosis with ARDS suggested that death rates are between 47 and 58%, which denotes early diagnosis and treatment as valuable prognostic indicators [9].

Our patient was diagnosed to have pneumomediastinum with ARDS and was managed in the ICU with mechanical ventilation with lung-protective strategies. But when he did not respond to antibiotics and other supportive measures, other causes were thought of. Further workup with CBNAAT gave the diagnosis of underlying tuberculosis which detected MTB with no Rif resistance. This case was considered as secondary spontaneous pneumomediastinum complicated by ARDS secondary to tuberculosis. As there is early mortality in our case, final outcome and confirmation of the diagnosis could not be assessed.

Conclusions

In young patients with acute spontaneous pneumomediastinum and ARDS without trauma, tuberculosis infection should be considered during initial diagnostics. This consideration may lead to timely treatments and improved patient survival. However, there are many challenges in doing so, especially when the disease is complicated by multiple diagnoses.

Abbreviations

MTB: *Mycobacterium tuberculosis*; ARDS: Acute respiratory distress syndrome; ICD: Intercostal drain; HRCT: High-resolution computer tomography; ATT : Anti-tubercular therapy; PEEP: Positive end-expiratory pressure; CBNAAT : Cartridge-based nucleic acid amplification test; PaO_2/FiO_2: Arterial oxygen partial pressure to fractional inspired oxygen; Rif: Rifampicin.

Acknowledgements

Nil

Authors' contributions

Concepts: PU, RM, SL, VG. Design: PU, RM,SL,VG. Definition of intellectual content: PU, RM, SL,VG. Literature search: PU. RM. SL. Clinical studies: PU, RM, VG. Experimental studies: PM. Data acquisition: RM, SL. Data analysis: RM, SL. Statistical analysis: PU, RM, SL, VG. Manuscript preparation: PU, RM, SL. Manuscript editing: PU, RM, SL,VG. Manuscript review: PU, RM, SL, VG. Guarantor: PU, The authors read and approved the final manuscript.

Funding

This was a single-center study and no intramural or extramural grants were obtained for conducting the study.

Availability of data and materials

Data and material will be available from the corresponding author.

Declarations

Ethics approval and consent to participate

Written informed consent was obtained from the patient's attendee (father) after demise of the patient for publication of this case report and any accompanying images.

Consent for publication

Written informed consent was obtained from the patient's attendee (father) after demise of the patient for publication of this case report and any accompanying images.

Competing interests

The authors declare that they have no competing interests.

Received: 20 July 2021 Accepted: 22 April 2022
Published online: 13 May 2022

References

1. Levy H, Kallenbach JM, Feldman C, Thorburn JR, Abramowitz JA (1987) Acute respiratory failure in active tuberculosis. Crit Care Med. 15(3):221–225
2. Lawrence C, Paul S (2000) Miliary tuberculosis, radiographic features. Appl Radiol.:25–28
3. Dixit R, Dave L (2007) Pneumomediastinum with subcutaneous emphysema in a silico-tuberculosis patient. Lung India 24:102–104
4. Dixit R, George J (2012) Subcutaneous emphysema in cavitary pulmonary tuberculosis without pneumothorax or pneumomediastinum. Lung India 29:70–72
5. Narang RK, Mital OP (1967) Interstitial and mediastinal emphysema complicating acute military tuberculosis. Indian J. Chest. Dis. Allied Sci. 9:58–60
6. Baron RM, Levy BD (2016) Recent advances in understanding and treating ARDS. F1000. Research. 22:1–6
7. Barbas CSV, Isola AM, Caser EB (2014) What is the future of acute respiratory distress syndrome after the Berlin definition? Curr Opin Crit Care 20(1):10–16
8. Mohan A, Sharma SK, Pande JN (1996) Acute respiratory distress syndrome (ARDS) in miliary tuberculosis: a twelve year experience. Indian J Chest Dis Allied Sci 38:157–162
9. Deng W, Yu M, Ma H, Hu LA, Chen G, Wang Y et al (2012) Predictors and outcome of patients with acute respiratory distress syndrome caused by military tuberculosis: a retrospective study in Chongqing. China BMC Infect Dis 12:121

Publisher's Note