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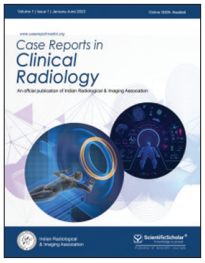

Case Report

Multiple pulmonary artery aneurysms in miliary tuberculosis

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ABSTRACT

Pulmonary artery aneurysms are rare life threatening complications of tuberculosis (TB). Clinical symptoms range from being silent to fatal hemoptysis. Computed tomography angiography is diagnostic and shows the vascular nature of the lesions and their origin from the pulmonary arteries. The typically described Rasmussen's aneurysm arises in cavitary TB due to inflammation induced damage to the tunica of the pulmonary artery. However, aneurysms may also rarely occur in non-cavitary TB. In this report, we describe a case of multiple aneurysms of the pulmonary artery in a case of non-cavitary miliary TB.

Keywords: Tuberculosis, Rasmussen aneurysm, Non-cavitary, Miliary tuberculosis, Pulmonary artery

INTRODUCTION

Pulmonary tuberculosis (TB) is caused by *Mycobacterium tuberculosis*, an aerobic, non-motile, Gram-positive, and acid fast bacteria. It is a major cause of morbidity and mortality, particularly in developing countries.[1] Over the past few years, even the developed countries are witnessing an increase in incidence of TB due to spread of human immunodeficiency virus, and other immunosuppressed conditions such as diabetes, drug abuse, patients under steroid, and anti-tumor necrosis factors for rheumatoid arthritis and other autoimmune conditions. In 2005, 8.8 million people developed active TB and 1.6 million died of the disease.[2]

The traditionally described patterns of pulmonary TB include a primary form which presents as hilar or paratracheal lymphadenopathy with ipsilateral airspace consolidation. In the secondary or reactivation form, consolidations, cavitation's, and centrilobular nodules with tree in bud pattern are seen.[3] Miliary TB is a distinct form of TB which can occur in both primary and secondary forms of TB. It is characterized by innumerable 1–3 mm sized nodules in random distribution throughout the lungs.[4]

Multiple complications may arise in TB either during the active stage or sometimes, years later after complete treatment of the disease. The vascular complications of TB may lead to hemoptysis, which may be potentially fatal if not treated well in time. In 80% of cases, it is the bronchial artery or any systemic artery which is responsible for hemoptysis, whereas in 20% cases it is the pulmonary artery that leads to hemoptysis.[5] Pulmonary artery aneurysms generally develop in the chronic stage of the disease.

In this report, we describe a case of multiple bilateral aneurysms in a case of miliary TB. Although, there have been various case reports in the literature, describing Rasmussen's aneurysms in cavitary TB, to the best of our knowledge, this is the first case report of pulmonary artery aneurysms arising in non-cavitary miliary TB.

CASE PRESENTATION

A 19-year-old female presented to the department of general medicine with symptoms of cough, shortness of breath on exertion for the past 2 months and fever and vomiting for the last 10 days. Cough was on and off, productive in nature, without any diurnal variation. The fever was documented to be 104°F, intermittent in nature and associated with chills and rigor. The fever used to subside after taking antipyretic medications. No episode of hemoptysis was present. She had developed tubercular meningitis 3 years ago for which she was prescribed anti tubercular therapy (ATT). However, she had discontinued the medication after symptomatic relief. On clinical examination, pallor and bilateral pitting edema were present. No obvious lymphadenopathy could be palpated. On auscultation, bilateral fine crepitations were found in bilateral lungs.

Her blood picture showed anemia (hemoglobin: 8.5 g/dL), normal white blood cells count (7.26 thousands/microlitre), mild thrombocytopenia (133 thousands/microlitre), elevated C-reactive protein (CRP) 31.76 mg/L, and deranged liver function tests (serum glutamic pyruvic transaminase: 11.2 U/L: serum glutamic oxaloacetic transaminase: 62.1 U/L, alkaline phosphatase: 447.4 U/L). The peripheral blood smear showed microcytic hypochromic anemia. Bone marrow biopsy revealed mildly hypocellular marrow with granulomatous pathology. Sputum cartridge based nucleic acid amplification test was positive for *M. tuberculosis*.

Ultrasound abdomen revealed mild splenomegaly. A chest X-ray revealed multiple small 1–3 mm nodules randomly distributed throughout bilateral lungs. Multidetector computed tomography (CT) thorax showed innumerable miliary nodules with fine intralobular septal thickening in bilateral lungs [Figure 1]. No evidence of lymphadenopathy, pleural effusion, consolidation, or cavitation was seen. A diagnosis of miliary TB with ATT induced hepatitis was made. The patient was started on a modified ATT regimen. Anemia was corrected with iron, Vitamin B12 and folate therapy, and 1 unit of packed red blood cells transfusion. After observing the subsidence of symptoms and a decreasing trend of CRP, the patient was discharged from the hospital.

After a gap of 6 months, the patient again presented with the same symptoms of intermittent fever, shortness of breath, cough and vomiting, increased in intensity for the past 7 days. No history of hemoptysis was found. The patient had been taking the modified ATT regime for the past 6 months. However, she had not taken the injectable Streptomycin after discharge from the hospital.

CT topogram showed multiple rounds to oval shaped opacities in bilateral lungs. The nodules appeared enlarged and more discrete as compared to previous chest X-ray. A CT angiography was done which showed multiple ovals to round contrast filling lesions, arising from the peripheral branches of the pulmonary artery in bilateral lungs, on background of few scattered miliary nodules [Figure 2]. The largest aneurysm measured 20 mm × 18 mm whereas the smallest aneurysm measured 4.5 mm × 4.0 mm. The 3D volume rendered image showed communications of these aneurysms with pulmonary artery branches. No other complication of TB such as lymphadenitis, effusion or cavitation was present. A diagnosis of pulmonary artery aneurysms was made. Since the lesions were clinically silent, a watchful wait was recommended. The patient was advised to continue the modified ATT regimen and counseled for periodic follow ups.

DISCUSSION

Several reports have described the formation of pulmonary artery aneurysms in cavitary TB. Aneurysms in miliary TB have only rarely been reported. [5,6] Few studies have described pseudoaneurysms of subclavian artery, thoracic and abdominal aorta in miliary TB. Pseudoaneurysm of aorta due to adjacent tubercular lymphadenitis in miliary TB has also been described.[7-9] Apart from TB, pulmonary artery aneurysms can also occur due to other causes such as iatrogenic trauma, infection, Behcet's syndrome, congenital heart disease, pulmonary hypertension, neoplasms, and connective tissue disorders.

In case of Rasmussen aneurysm, the pathogenesis of pseudoaneurysm is believed to be the spread of inflammation from adjacent consolidation into the tunica of the pulmonary artery, bronchial artery or aorta whereas in miliary TB, it is hypothesized that the infection spreads to the tunica of arteries via the bloodstream, leading to TB induced vasculitis of pulmonary artery.[7] This seems true in our case as there were no consolidations or cavitation in the lung except for small miliary nodules. Diffuse distribution of aneurysms in bilateral lung fields in our case, also supports this hypothesis.

Rasmussen aneurysms in cavitary TB commonly present with hemoptysis owing to their high risk of rupture. In a case study of seven tubercular patients who died of fatal hemoptysis, all patients had lung consolidations with large aneurysms with mean size 5 cm.[10] Therefore, Rasmussen's aneurysm must be treated either via radiological interventions such as endovascular embolization or through surgery such as aneurysmectomy, lobectomy, or pneumonectomy. However,

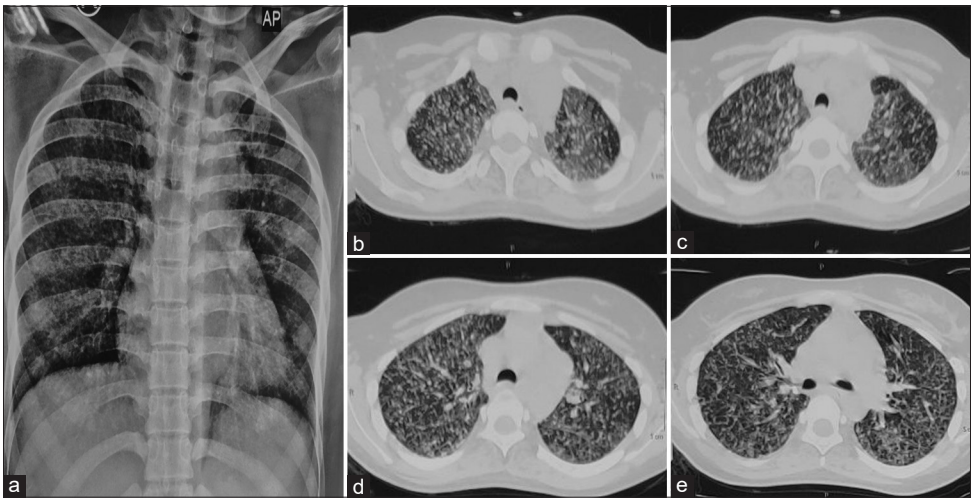

Figure 1: Chest X-ray on first visit shows multiple miliary nodules randomly scattered in bilateral lung fields (a). Axial multidetector computed tomography images on first visit in the lung window shows multiple miliary nodules in bilateral lungs with fine intralobular septal thickening. No evidence of enlarged nodes, effusion, consolidation or cavitation seen (b-e).

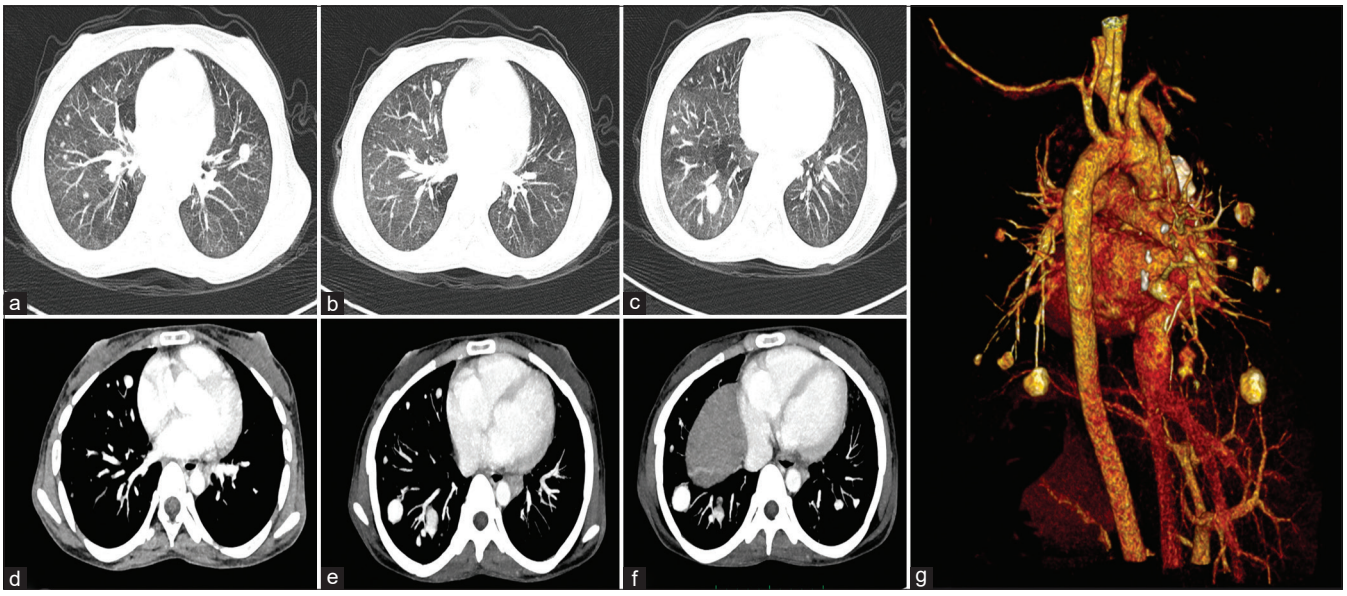

Figure 2: Axial computed tomography angiography images after 6 months in lung window (a-c) shows new rounded nodules communicating with segmental branches of pulmonary artery in bilateral lungs. In the mediastinal window (d-f) the nodules fill with contrast. Few miliary nodules persist in the background. No consolidations or cavitation's are seen. 3D Volume Rendered Image shows the aneurysms communicating with peripheral branches of the pulmonary artery (g).

the aneurysms in our case were variable in size and they were clinically silent. The patient had no episode of blood tinged sputum and she remained asymptomatic for these aneurysms during her entire follow-up. This shows that the aneurysms in cavitary TB and in miliary TB are two separate entities in terms of pathophysiology and clinical presentation and hence separate treatment strategies may be needed in the two cases.

This case also illustrates the role of CT angiography in detecting the vascular complications of TB. Diagnosing small aneurysms is a challenging task as aneurysms often get masked by inflammation in adjacent lung parenchyma. While comparison of previous X-rays can serve as the first cue, CT angiography helps to confirm the diagnosis and rule out rupture. CT angiography also rules out other complications of TB that present with hemoptysis such as bronchiectasis and pulmonary embolism. Hence, CT angiography is essential in all cases of TB with suspected vascular complications.

CONCLUSION

Multiple aneurysms of the pulmonary artery may develop in miliary TB, possibly by spread of bacteria to the arterial walls through the bloodstream leading to TB induced vasculitis. These aneurysms behave differently from the classical Rasmussen's pseudoaneurysms that have been described in cavitary TB. CT angiography is an essential modality to detect and prognosticate them.

TEACHING POINTS

1. Vascular complications of tuberculosis lead to formation of aneurysms of the pulmonary artery, bronchial artery, aorta, and rarely other systemic arteries.
2. Rasmussen's aneurysms are pseudoaneurysms of the pulmonary artery that develop within a cavitary consolidation of pulmonary TB.
3. Aneurysms of pulmonary arteries may also develop in miliary TB without any cavitation in the lung. These aneurysms have different pathophysiology, clinical presentation, and prognosis than Rasmussen's aneurysm.
4. CT angiography is the investigation of choice for diagnosing tuberculosis related vascular aneurysms.

MCQs

1. Which of the following is the best description of Rasmussen aneurysm
   a. Aneurysm of aorta in pulmonary TB
   b. Aneurysm of pulmonary artery in cavitary TB
   c. Aneurysm of pulmonary artery in miliary TB
   d. Aneurysm of bronchial artery in pulmonary TB

Answer Key: b

2. Which of the following tubercular complications is not associated with hemoptysis?
   a. Bronchiectasis
   b. Pulmonary embolism
   c. Pseudoaneurysm
   d. Pneumothorax

Answer Key: d

3. Investigation of choice for tubercular complications is
   a. Flexible fiberoptic bronchoscopy
   b. Chest X-ray
   c. MDCT
   d. CBNAAT

Answer Key: c

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The author(s) confirms that there was no use of Artificial Intelligence (AI)-Assisted Technology for assisting in the writing or editing of the manuscript and no images were manipulated using the AI.

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